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ELECTRICAL REVIEW

FOUNDED 1872

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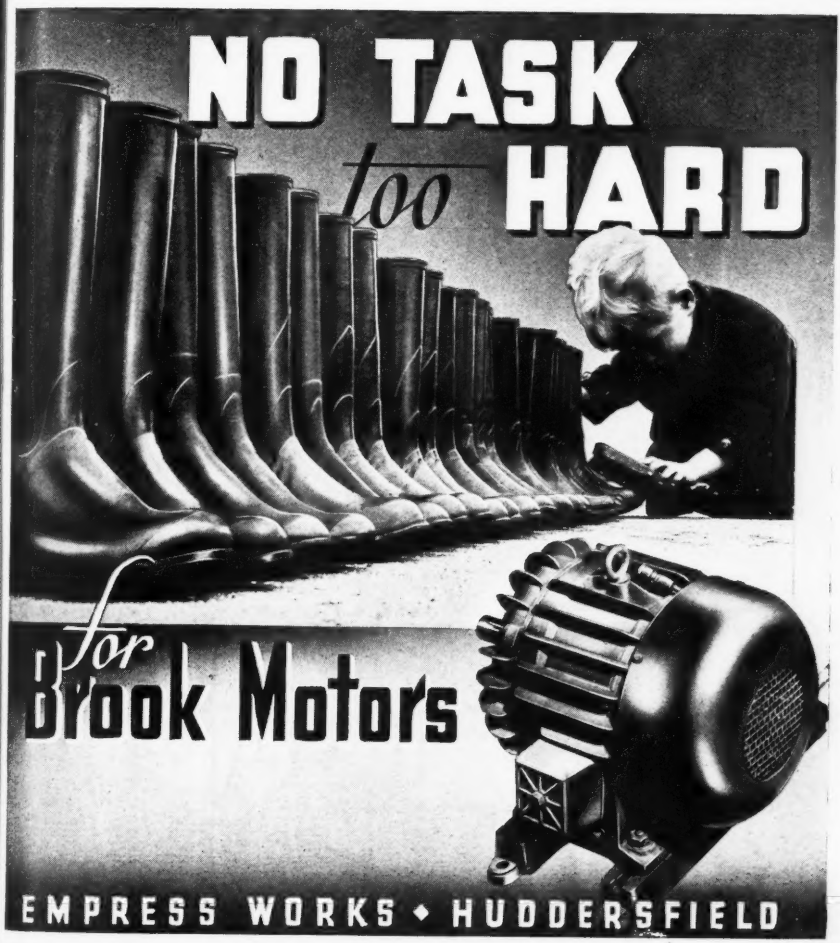

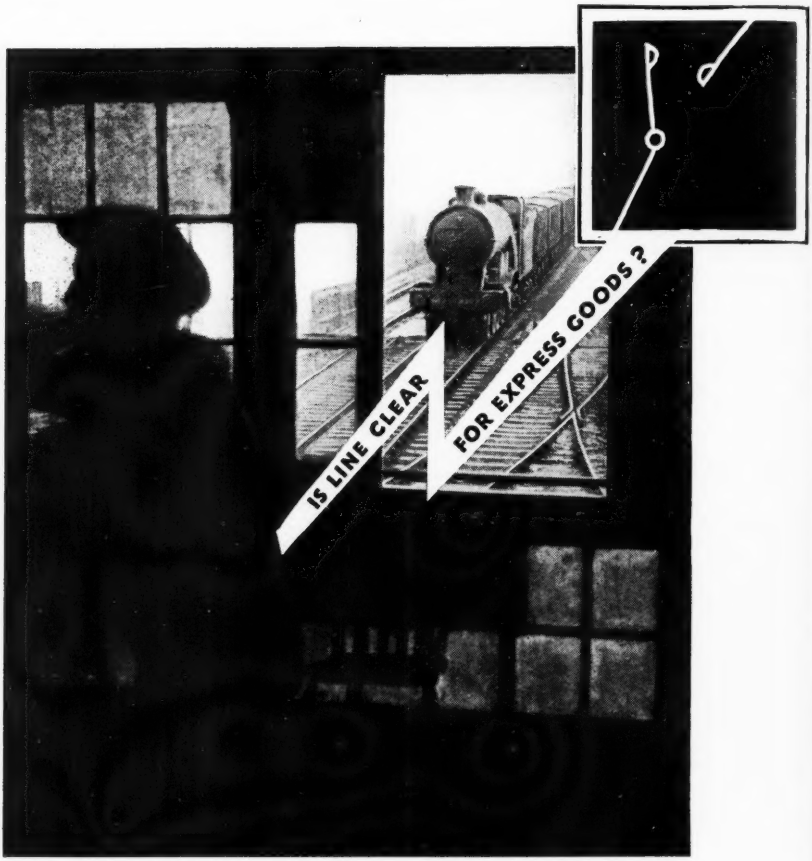

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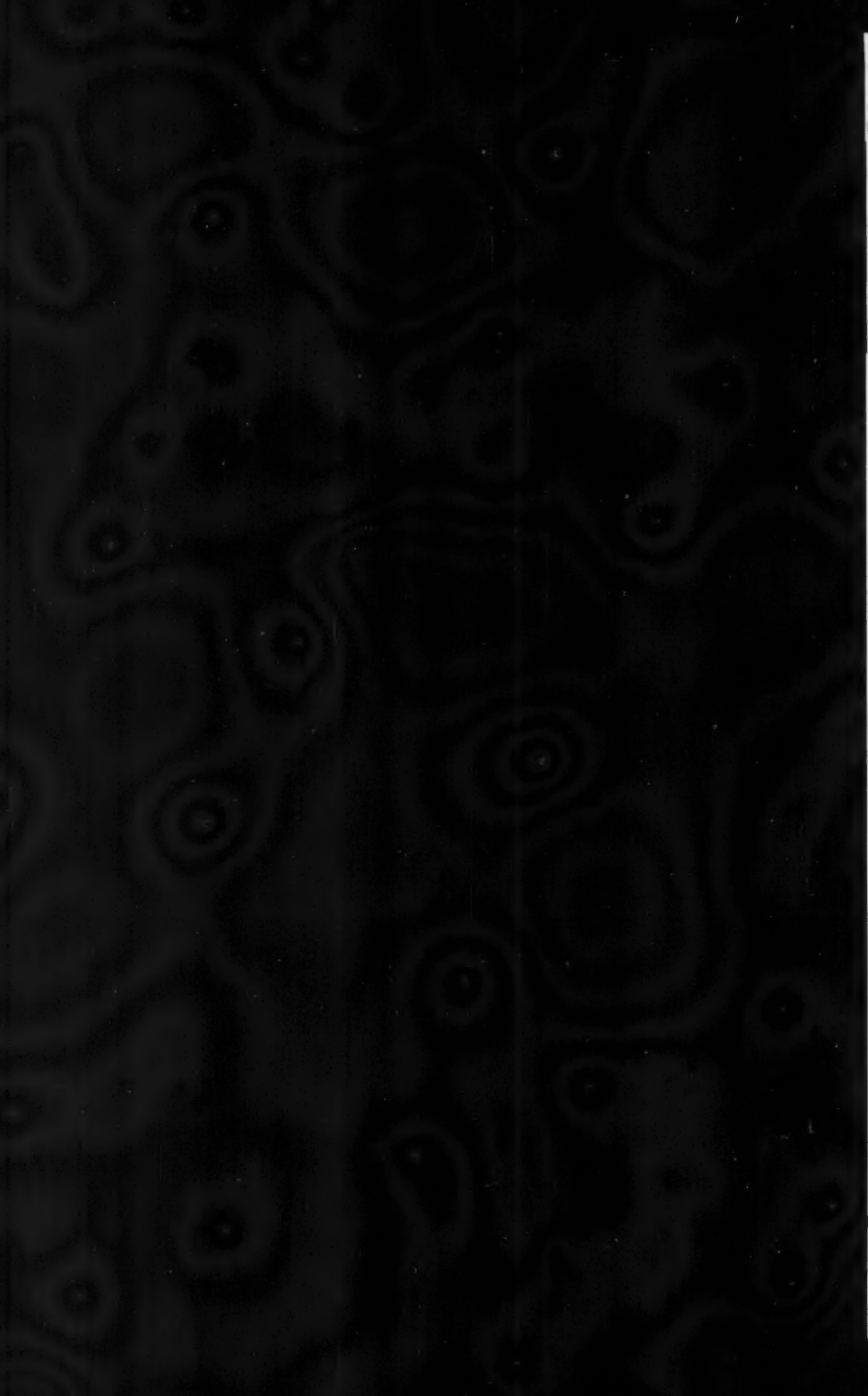

ELECTRICAL REVIEW

Volume CXXX No. 3364

Friday, May 15, 1942

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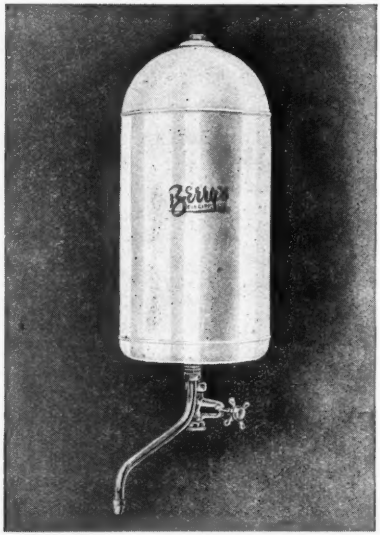

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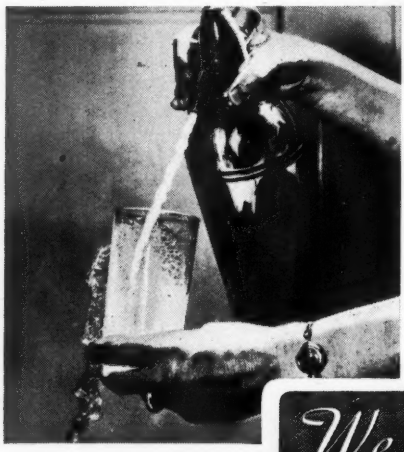

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ELECTRICAL REVIEW

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Vol. CXXX. No. 3364. MAY 15, 1942 6d. WEEKLY

The Institution's Work

Possible Widening of Membership

THIS month sees the end of the technical meetings of the Institution of Electrical Engineers for the 1941-42 session. It has been a notable session in many ways. Evening meetings have been restored with the addition of a full programme for the new Installations Section, which was inaugurated last September with the immediate object of dealing with wartime problems. Full justification for the setting up of this Section is to be found in the number of members present at its meetings, the average having appreciably exceeded the attendances at any of the older sections, good as these were having regard to the circumstances. Corresponding activity in all branches has been manifest in the Local Centres and the particulars relating to them now given each month in the I.E.E. *Journal* add considerably to the interest of its contents.

Post-War Planning

All this goes to show that these occasions provide a welcome form of recreation from those duties more directly connected with the war which absorb the energies of members during working hours. The same may be said of the post-war planning discussions which have been held all over the country, and it is noteworthy that among the moving spirits in this connection are many of those who are most strenuously engaged in the national effort.

This brings us to the most important of the long-range studies undertaken by the Post-War Planning Committee, *viz.*, the paper on the training of engineers which provided matter for discussion that could easily have occupied more than the two evenings available for the purpose.

A significant feature of the past twelve months is that the number of elections to membership is the highest yet recorded. One cause, though not the only one, is the enrolment as student members of undergraduates under the State bursary scheme.

National Service

So much for the work of the Institution that lies in the foreground. Less obvious, though no less strenuous, is the national service which the Council and its various committees have performed and will continue to perform throughout the coming summer with the aid of a depleted permanent staff, to whose unstinted labours the President, Sir Noel Ashbridge, in presenting the report of the Council earlier this month, paid a well-merited tribute. This service includes the Central Register, the provision of technical man-power for the forces, prevention of its misapplication, technical tuition for the forces and liaison with other bodies to enable engineering to play its full part in winning the war.

Among the most important of the matters now under consideration is the attitude of the Institution towards honest electrical practitioners whose attainments do not reach the high standard necessarily required for acceptance in any existing class of membership. There have always been such men, but their numbers will be greatly swollen as a consequence of the war. Some of them will have been

"up-graded" as a result of natural engineering ability, while others may have shown an aptitude within a limited field. We believe that the majority of I.E.E. members would wish the Institution to take them under its wing, subject to two provisos. The first is that the professional standing of the existing classes of members shall not be thereby prejudiced; the second is that the public shall not, on account of the prestige of the Institution, be led to assess the qualifications of such men at more than their intrinsic worth.

The Fuel Debate

LAST Thursday's debate on fuel rationing served solely to emphasise two obvious points: first that only increased coal production could remedy the threatened shortage and secondly that rationing was difficult if not impossible and at the best a mere palliative. The Government intends to issue another White Paper containing its final proposals and to give time for a further debate before Whitsun if members desire it. It is hard to see what more remains to be said on the subject. If the Government is determined to proceed with a rationing scheme we do not suppose that further discussion will dissuade it and the industries concerned will have to operate it whatever doubts they may have. It was unfortunate that Mr. Greenwood characterised the honest expressions of opinion by the coal, gas and electricity suppliers as a "deliberate campaign," in spite of the fact that the Beveridge Report itself contained full justification of their attitude.

What is the Alternative?

WE still do not think the Beveridge proposals worth trying and we are equally dubious about Sir Arnold Gridley's plan, which was the only alternative put forward. Nobody will contest the truth of the Government's contention that fuel must be saved. Coal, a tangible substance, can be rationed and if coal is rationed it is clear that consumers must not be able to switch over to electricity and gas instead. It is practically impossible to ration services such as gas and electricity, and yet if it is not attempted the rationing of coal alone is rendered nugatory as well as inequitable. Voluntary economy seems to be the only possible alternative to compulsory restriction and we still believe that a sustained campaign on more realistic lines than that pursued during the past year or so would produce results.

Limitation of Heaters

ATTENTION has been drawn on many recent occasions to the large numbers of electric heaters of anonymous make which have made their appearance in many shops in spite of the shortage of materials. They have been resented for a number of reasons: that they are frequently unreliable or even dangerous; that they are sold by retailers who were not in the business before the war; and that they encourage the wasteful use of energy at a time when economy is called for. So far as these appliances are concerned, therefore, there will be little grief at the imposition of a 25 per cent. limitation by the Board of Trade upon domestic gas and electric space-heaters. As in the case of most limited goods, the restriction is greater than the figure suggests, for the quota is based upon value and values have risen considerably since the outbreak of war.

Output and size

A PROBLEM posed in the present extension to Montaup power station, Massachusetts, was how to install a boiler rated at 650,000 lb. per hr. at 1,825 lb. per sq. in. and 960 deg. F. in space originally designed for a 200,000 lb. unit at 375 lb. per sq. in. The adoption of forced circulation, giving a ratio of water circulated to steam generated of 3.85 to 1, as compared with 10 to 1 for a corresponding natural-circulation boiler, is said to have obviated the need for any building reconstruction. The steam is supplied to a new 25,000-kW topping turbine which exhausts to two existing turbines, after reheating, enabling them to give nearly 50,000 kW between them.

Tailpiece

IN a police court report a local newspaper quotes what purports to be a paragraph from a supply company's application form:—"A consumer is also responsible for the preservation of the lead seals affixed to the company's apparatus, and must not on any account be removed except by the company's officials." Although we have not examined the company's Special Order, we question its right so to restrict consumers' movements.

Steam-Temperature Control

Constancy over a Wide Range of Turbine Loading

By "Entropy"

THE demand for high steam temperature has brought in its wake the demand from the engine room for maintaining it constant over a wide range of load. With extremely high temperatures the desire for some degree of control is shared by boiler manufacturers as they have found that it enables the limiting conditions of design to be more definitely established.

Besides discussing general practice in this country, the author describes other interesting methods which as yet have not been widely adopted

The steam temperature obtained from a superheater installed in a position where the gas inlet temperature is in the vicinity of 1,700 to 1,900 deg. F. will be generally in accordance with the characteristic shown by fig. 1. Should the superheater be placed in a low gas-temperature zone there will be less heat transferred by radiation, which will result in a steeper steam-temperature characteristic. Conversely, the higher the gas-inlet temperature the greater the radiant-heat transfer and the flatter the steam-temperature characteristic; in fact heat transfer by radiant heat alone will reverse the slope of this characteristic.

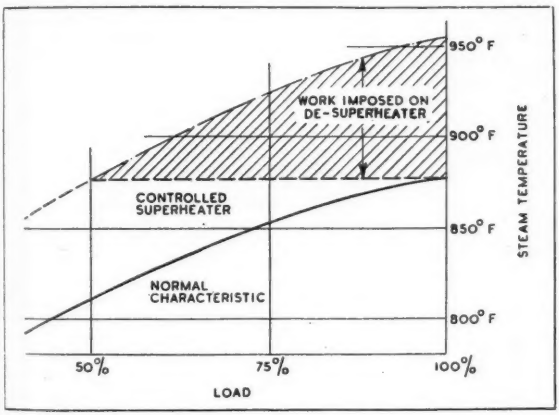


Fig. 1.—Effect of modifying superheater to give final steam temperature at half load

By employing both radiant and convection superheaters in series in correct proportions of heating surface a fairly flat characteristic will result. In practice the variation in steam temperature is greater than that determined by theoretical considerations, as the condition of the boiler and superheater external heating surfaces exert considerable influence, whilst changes in the amount of excess air carried in the furnace will accentuate further the variation in steam temperature. In addition alterations in feed temperature, such as those occasioned by the cutting out of feed-heating stages, affect considerably the performance of the superheater.

The maintenance of constant steam temperature over a range of boiler output means, in the first instance, that the extent of the superheater heating surface is determined by that required at the minimum boiler load from which temperature control commences. Temperature control cannot therefore be obtained merely by installing control equipment; there must first exist the means of obtaining the desired steam temperature at the minimum load; this leads frequently to difficulties in design. If, for instance, the superheater having the characteristic indicated by fig. 1 were modified so that the final steam temperature of 875 deg. F. was obtained at 50 per cent. boiler rating, an increase in superheater heating surface of the order of 100 per cent. would be entailed.

A less severe increase in surface would be involved if the superheater were placed nearer the furnace, since this would result in a higher mean temperature difference and a flatter superheater characteristic due to greater absorption by radiation. The danger of placing a convection superheater near the furnace outlet is that it approaches the zone where, with certain fuels and methods of firing, slag formation may occur. Should, however, the combustion conditions be such as to ensure immunity from slag formation, high gas temperatures are generally regarded as responsible for constructional difficulties, particularly in respect of supports and tube distortion. As a consequence the general practice is to interpose

between the furnace exit and the superheater inlet sufficient boiler surface to lower suitably the gas temperature. In general, therefore, a constant steam temperature over a wide range of load is made possible only by an appreciable extension of the normal superheater surface.

If the generating unit is constructed so that the desired steam temperature is obtainable at the minimum load of the controlled range, this temperature can be held constant either by making arrangements to use ineffectively the superheater heating surface at will or to reduce the excessive steam temperatures which will occur at boiler loads above the minimum at which control is to commence. Thus it seems that a double expense is involved, first, by the installation of superheater surface capable of producing, for the major part of the unit's existence, steam temperatures in excess of those required and, secondly, by the provision of equipment necessary to destroy in part the work done by the oversize superheater. The economics of the case from this aspect alone does not appear sound, but it is evident from the popularity of the process that the beneficial results in the engine room more than restore the balance.

Of the variety of ways in which temperature control may be effected, the best known are regulating the gas flow across the superheater and de-superheating to the desired level. By regulation of the gas flow the available temperature head may be varied widely and so the overall heat transmission may be adjusted to give the desired superheater performance.

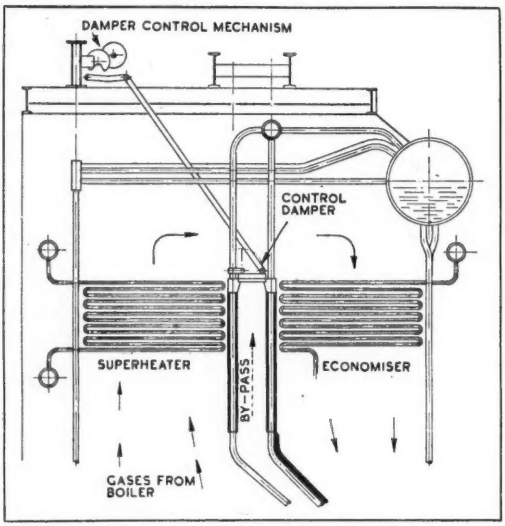


Fig. 2.—Temperature control by regulation of gas flow across superheater

In the arrangement shown in fig. 2, the gases taken up the by-pass flue avoid positively the entire superheater, which is essential to the success of the method. Quite frequently superheaters are arranged so that the gases travel over the heating surface partly in cross flow and elsewhere in longitudinal flow. Usually with this type a gas by-pass can be arranged for part of the heating surface only, and cannot greatly influence the overall performance of the superheater, especially when, as is usual, the section over which all the gases pass is in cross flow.

Sectional By-pass Control

In the example shown in fig. 2 the final steam temperature is held constant by means of a thermostat installed at the superheater steam outlet, which controls by automatic mechanism the dampers of the gas by-pass. The by-pass control damper is constructed in sections, each subject to individual adjustment; thus the quantity of gas by-passed can be regulated within close limits, a factor essential to sensitive control. The principle of gas-flow control provides in practice a number of variations, foremost among which is the installation of superheater and boiler surface in parallel flow on the gas side. With this arrangement the control dampers are placed at the boiler exit so that gases may be diverted to or from the superheater section according to the indication given by the thermostat at the steam outlet.

Arrangements such as these find considerable support on the grounds that, in addition to providing effective control, they afford appreciable protection to the superheater during starting up, when insufficient steam is being generated to ensure satisfactory circulation.

In the category of gas-flow controlled superheaters may be placed the gas re-circulation arrangement, although in principle it has little in common with those already mentioned. Its basis is control of the gas temperature at the superheater inlet by re-circulation of relatively cool gases from the induced-draught fan outlet to the gas inlet of the superheater chamber. The gases thus injected cause a general lowering of gas temperature throughout the superheater, thereby reducing the mean temperature difference. Although the weight of gases passing is increased by the amount of gas re-circulated and the convection transfer rate is actually increased, this is more than offset by the drop in temperature head so

that the net result of gas re-circulation is to reduce superheater performance.

To produce a constant steam temperature over a range of boiler load the superheater is dimensioned to give the necessary temperature with a normal gas flow at the minimum load of the controlled range. At loads in excess of this minimum, gas re-circulation is introduced automatically at a rate increasing with the boiler load and the entire superheater is fully utilised at all rates of steaming. It has the disadvantages of entailing a reduction of the available temperature head at high loads, which have an adverse effect beyond the superheater, and of involving provision of additional induced-draught fan capacity to accommodate the gases re-circulated at the maximum load.

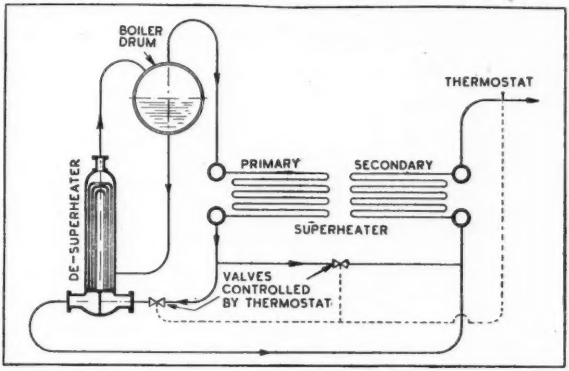


Fig. 3.—Steam temperature automatically controlled by valves regulated by a thermostat at the superheater outlet

Steam-temperature control may also be effected by de-superheating on the non-contact principle using feed or boiler water as the cooling medium. With the former arrangement the de-superheating takes place usually in the steam main and in such cases the supply of the cooling water is incorporated in the feed-heating system. Where boiler water is used for cooling de-superheating is usually carried out between steam inlet and outlet of the superheater since the maximum steam temperature within the superheater is then under control.

Position of De-superheater

The de-superheater can be conveniently inserted between the steam passes of a multi-pass arrangement or between the sections when the superheater is constructed in more than one unit. A reasonable temperature head should be available at the point selected, but for superheater protection the point should not be near the final steam outlet. The usual non-contact de-superheating unit consists of a nest of tubes (carrying the steam to be cooled) housed in a pressure vessel through which the cooling medium flows. The unit is installed in parallel with the steam main or with the piping connecting the superheater sections.

Control of steam temperature is generally obtained by adjusting the amount of steam present through the tubes by means of valves which are commonly regulated from a thermostat placed at the superheater outlet when interstage de-superheating is employed as shown in fig. 3. The control valves here are external to the de-superheater vessel, but in other equally well-known types the valves are housed in the base of the main vessel. In this case the cooling medium is water from the boiler drum, natural circulation of which is promoted by locating the vessel containing the cooling coils at a reasonable distance below the water level of the main steam and water drum. Steam passing through the coils imparts heat to the surrounding water, thus causing the formation of vapour which is conducted from the top of the de-superheater vessel to the steam space of the boiler drum.

This type of de-superheater, while generally associated with natural-circulation boilers, is also used in some forced-flow types; when applied to the latter the cooling water is pumped through the coil, thus giving freedom in the disposition of the de-superheater vessel relative to the boiler drum. This form of control is thermally efficient in that all the superheater surface can be fully utilised at all rates of steaming. The de-superheater acts virtually as an extension of the boiler convection surface, using steam heated in excess of that required by the prime mover or process as the heating medium.

British and Continental Practice

The de-superheater shown in fig. 3 represents the type generally used in this country, but common Continental practice of recent years has been to de-superheat with feed water sprayed into the steam main or into the connecting pipes with a two-stage superheater. This type of de-superheater is of comparatively simple and inexpensive construction, but many authoritative opinions are that any impurities in the feed water thus injected into the steam will be carried over to the prime mover or possibly be deposited in the final stage of the superheater. With the procedure prevalent in this country, any such solid matter is deposited in the boiler and can be readily blown down.

With low-rated boilers producing steam at low temperatures and pressures a certain amount of temperature control can be effected by the partial by-passing of the superheater on the steam side. Steam from the superheater outlet may be mixed with steam at saturation temperature from the boiler drum to give the desired final steam temperature. This method of control jeopardises the life of the superheater since the steam passed through it is reduced, whilst the temperature and quantity of the gases entering the superheater are unchanged. If applied with moderation the results are not serious when the superheater is situated in a low-temperature zone, but the practice is not recommended for more arduous conditions. A superheater can rarely be installed in a low-temperature zone and be capable of meeting the demand of constant temperature over a wide range of load and a mixing valve is seldom used strictly in this sense.

Installation of Heat Exchanger

Constant final steam temperature is obtained in another method by controlling the wetness of the steam at the superheater inlet, a heat exchanger being placed in parallel with the economiser on the water side. Steam from the boiler drum on its way to the superheater inlet is passed over the coils of the heat exchanger which are cooled with water from the feed line. By a system of valves controlled automatically from a thermostat situated at the superheater outlet the rate of water flow through the heat exchanger is regulated to give the requisite degree of cooling. As this apparatus uses feed water as the cooling medium, a reasonable temperature head is available, this being essential to an economical arrangement of cooling surface and for sensitivity in operation.

When the heat exchanger is installed in parallel with the economiser, the latter is by-passed according to the amount of feed water through the cooling coils. This arrangement will effect adversely the thermal performance of the economiser and, where normally the water outlet temperature from the economiser is near saturation temperature, an excessive amount of steam may be produced when the water flow is reduced.

Double-Furnace Arrangement

In some instances in the United States, high steam production from a single unit has been obtained by equipping the boiler with twin furnaces in order to provide for the inclusion of the radiant-heat absorbing surface necessary to keep the gas temperature within satisfactory limits. The two parallel furnaces, which are completely water-cooled, are fired independently. By regulating the rate of firing in each furnace a certain degree of control of the entering gas temperature can be obtained.

An oversize convection superheater equipped with a gas by-pass or an interstage de-superheater can also be visualised. In an installation under construction the twin furnace theme is extended so as to give a range of load over which the steam may be controlled at a fixed level. The boiler and superheater circuits are in parallel on the gas side. The superheater comprises a radiant section, forming part of the furnace cooling system, followed by a section of convection superheater surface installed at the gas exit from this furnace. The boiler comprises a completely water-cooled furnace discharging into a bank of convection surface. The walls of the superheater furnace, where not cooled by radiant superheater surface, are cooled by tube surface in circuit with the boiler. The gases from the two sections mix and enter a common economiser and airheater from which point the arrangement can be regarded as orthodox.

While a combination of the opposing characteristics of radiant and convection superheaters tends towards a uniform final temperature, the mere installation of the two types does not provide means of control, but this can be obtained adequately by adjustment of the rate of firing with a twin-furnace arrangement. The proportion of radiant and convection surface has been chosen so that firing rates of the two furnaces proportional to the boiler load are anticipated to produce a constant temperature over an extremely wide range. In practice it is almost certain that operating conditions will deviate from the theoretical assessment, but there is little doubt that as regards control of steam temperature, these deviations can be met by adjustment of the rate of firing of the two furnaces.

India's War Production

AN article on war production in India published in the *Indian and Eastern Engineer* states that among electrical engineering items the manufacture of cable and telegraph and telephone stores has been noteworthy. A leading cable company has so far supplied over 50,000 miles of tinned copper wire and telephone wire, while large quantities of a special "degaussing" wire have been manufactured. Many other types of cable, wire and strand for the Army, Navy and Air Force are also being produced. The Posts and Telegraphs workshop has turned out large quantities of telegraph and telephone apparatus and equipment, and is at present developing the manufacture of field service telephones. A short-wave wireless transmitter and auxiliary apparatus have also been designed and constructed in the workshop. Other notable electrical manufactures are accumulators, dry cells and batteries, transformers, insulators, switchgear and fans.

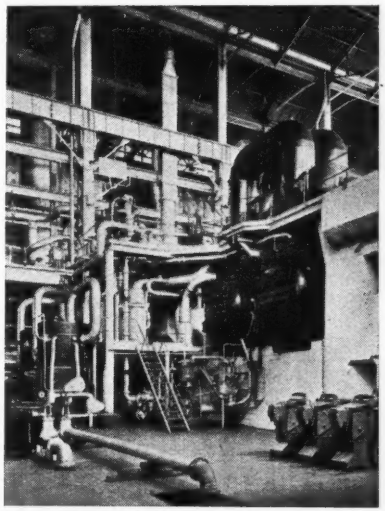
The *Indian Textile Journal* reports that the Import Trade Controller, Bombay, has issued a notification informing importers of all fabricated mechanical or electrical component parts and accessories that there is no prospect of their obtaining them from America unless all information regarding the user, purpose and degree of urgency is furnished.

Power on the Rand

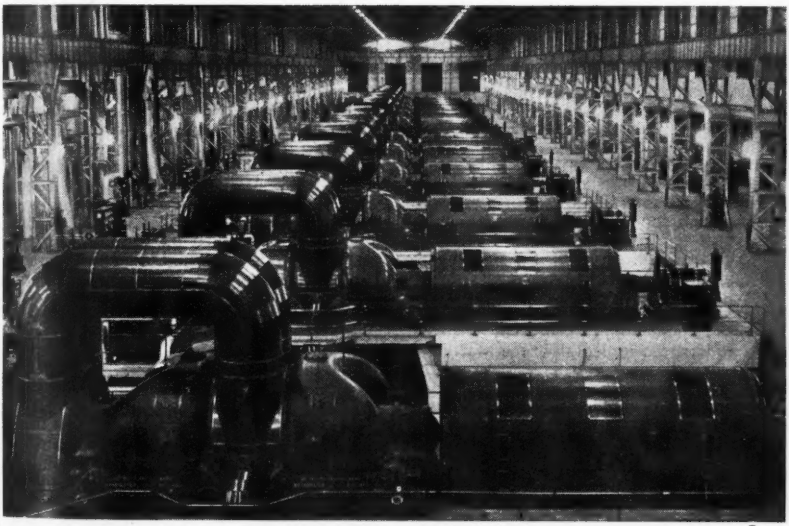
Klip Generating Station Completed

SINCE its completion in 1940, when the addition of two sets brought the total capacity to 424,000 kW, the output of the Klip generating station, which is situated thirty miles south of Johannesburg, has been more than twice that of any station in Great Britain. In 1940 the figure was 2,566 million kWh at a load factor of 80 per cent. The station is owned by the South African Electricity Supply Commission and operated by the Victoria Falls and Transvaal Power Co., which was responsible for its design and construction to the approval of the Commission, and is linked up with six other stations.

A notable record was achieved in its construction in that the first section of 132,000 kW was put into commercial operation (in July 1936) within twenty-five months of the start of excavation of the ground. The generating plant now comprises twelve 33,000-kW, 3,000-RPM main turbo-alternators and four 7,000-kW, 3,000-RPM house sets, all of which, with their condensing plant and auxiliaries, have been manufactured by Metropolitan-Vickers Electrical Co., Ltd., which is also completing two similar 33,000-kW sets (but designed for higher initial steam conditions) for the Vaal power station, now being erected. The turbine room at Klip is 819 ft. long by 100 ft. between



One aspect of the condenser basement



Klip Power Station—the turbine room

crane centres. The main turbines are two-cylinder machines, the l.p. being of the double-flow central-inlet type exhausting to twin condensers. Initial steam conditions are 345 lb. per sq. in. and 734 deg. F., the vacuum being 28.1 in. Hg. (bar. 30 in.) at the maximum load, which is also the most economical load. There are thirteen impulse stages in the high-pressure cylinder, and five in each flow of the low-pressure cylinder.

Each complete condenser has a cooling surface of 15,000 sq. ft. and is supplied with 24,000 gal. of water per min. The condensers are of the central-flow two-pass type in which steam is admitted to almost the entire periphery of the tube nest and air is withdrawn at the centre to give a high rate of heat transmission, high condensation temperature and effective de-aeration. Inlet water is supplied to the central core of tubes, the return flow being through the outer tube belt.

The main turbines are arranged for three-stage feed heating, embodying one h.p. and two l.p. heaters supplemented by a gland heater and a drain cooler (all of the Met-Vick. "U" type), the final feed temperature being 252 deg. F. at maximum load. Two Met-Vick. evaporator units for each set, operating in parallel or in single-stage effect, are supplied from the h.p. feed-heater tapping and discharge to the steam space of No. 2 l.p. heater. The 10.5-kV alternators are rated at 40,000 kVA at 82.5 per cent. power factor. Ventilation is by closed-circuit system, motor-driven fans supplementing the rotor fans.

Each of the single-cylinder auxiliary turbines has a velocity-compounded stage followed by twenty-six impulse stages and exhausts to a central-flow condenser with a cooling surface of 7,500 sq. ft. Single-stage feed heating raises the temperature to 158 deg. F. at maximum (and most economical) load. The alternators are wound for 2.1 kV and are also cooled on the closed-circuit system.

A view of the boiler house from the firing floor

Steam is raised in twenty-five Babcock & Wilcox boilers with normal outputs of 180,000 lb. per hr. fired by chain grate stokers. Each boiler is provided with a separate chimney 8 ft. in diameter and 240 ft. high, the top 100 ft. of which is of copper alloy. The boiler room is 743 ft. long by 185 ft. wide. Ash is removed by a hydrojet system and discarded on to the veldt some distance away by means of three duplicate ropeways. Coal is delivered to the bunkers by conveyors direct from the coal face of a new colliery.

Make-up water is pumped from Vereeniging, about six miles away, but as the difference in elevation is small pumping costs are moderate. For cooling condensing water ten 220-ft. concrete towers, designed by Mouchel and Partners, are installed, each with a pond diameter of 200 ft. About five million gallons is lost by evaporation daily.

Mr. N. Brookshank, chief London engineer, Victoria Falls and Transvaal Power Co. Ltd., was responsible for the technical design of the station and the arrangement of the plant.

Fuel Rationing Debate

Further White Paper Promised

ON Thursday last week the debate on the Government's fuel-rationing scheme took place in the House of Commons. Introducing the subject, the President of the Board of Trade (Mr. Hugh Dalton) spoke of the serious situation which would confront the country if coal production was not increased and consumption reduced, and referred to the reception by the Press and public of the rationing scheme drawn up by Sir William Beveridge.

Mr. Dalton emphasised that it was important not only to secure a lower domestic consumption but also to ensure fair distribution; that was not achieved last winter. The stocks of some gas and electricity undertakings were then reduced to a dangerously low level and he had been assured by the Public Utilities Coal Committee that unless they could begin the winter with something more than six or seven weeks' stocks they would be unable to accept responsibility for the maintenance of the gas and electricity services.

Probable Export Demand

In addition to increased home demands we might be called upon to increase our coal exports and, owing to the situation in the Atlantic, we must substitute coal for oil wherever we could.

The Government had in mind the problem of production. About 7,000 miners were being released from the Forces for the pits and a further 4,000 from Civil Defence, but this 11,000 would only make up the wastage for five or six months. It was not desirable to take the full number required—from 15,000 to 30,000—from the Army thereby stripping many battalions and dislocating countless other units of all kinds. They were also pretty well at the end of the process of withdrawing miners from other industries.

He considered that he had proved that rationing was an urgent necessity. Although propaganda could be a very valuable supplement it would not alone achieve the desired end. He briefly reviewed the Beveridge proposals (which were outlined in our issue of May 1st) and claimed that they were the best which could be devised. An Order had already been made to secure the registration of households with coal merchants.

For the fixing of the house ration by local fuel overseers there was to be a form of a very simple character which the public would be asked to fill up and the assessment of the house ration would be simple in the majority of cases; it would depend upon the number of rooms and the area in which the house was situated. Consideration of the size of the rooms and the altitude of the house would introduce complications. Account would be taken, however, of bomb-damaged buildings, sickness and premises used partly for business premises.

He realised that as gas and electricity were used first and paid for afterwards there would be difficulties with regard to the collection of coupons. Representatives of these industries had suggested, and he put it forward as a basis of discussion, that coupons need only be taken by meter readers who actually collected the cash. People who paid their accounts by cheque or otherwise could send coupons at the same time.

A number of people might inadvertently exceed their ration by a small amount and such cases could be met by deducting the excess from the next period's allowance. More serious excesses could be met by imposing fines and in the few flagrant and deliberate cases the supply might have to be cut off.

Mr. Dalton claimed that women's organisations which he had consulted generally considered this the fairest possible scheme and it also had the support of Sir Cyril Hurcomb, chairman of the Electricity Commission, and Sir Archibald Page, chairman of the Central Electricity Board. Other representatives of the gas and electricity industries felt unable to recommend any scheme at all.

He concluded by reiterating the necessity for rationing. The Beveridge scheme had great merits, but many thought that they could improve upon it and he invited them to tell the Government how.

A "Deliberate Campaign"

Mr. Greenwood expressed the view that the case for the acceptance of the principle of rationing was proved. The original announcement was fairly well received, but since then there had been a deliberate campaign against the scheme by the gas, coal and electricity industries. It was also necessary, however, to increase the output of coal and the reorganisation of the industry was the only way to effect this.

Sir Arnold Gridley said that the acceptance of the repeated recommendations of the Select Committee on National Expenditure would have avoided, or considerably lessened, the urgency of the matters now being discussed. Referring to the rationing scheme, he said that the assessment of the allowances of 12,000,000 households would involve an immense amount of labour and paper. Three or four times the present number of meter readers would be needed; he put the number of additional permanent employees at 20,000.

After pointing out many other drawbacks to the proposals Sir Arnold said that he would hand the President of the Board of Trade an

alternative and constructive plan. First an appeal should be made to the people by the Prime Minister or the Leader of the House to economise at once to the extent of, say, 20 per cent. of their consumption of coal, gas and electricity. As soon as possible thereafter the supply of coal, gas and electricity should be rationed, but through the distributors, the use of electricity and gas to be restricted through the agency of the statutory undertakings. The supply of coal and coke could be controlled by and equitably distributed through the existing merchants and distributors. There would be a definite datum line of coal supply which should be assured to the small householder. He was told that this would cut out the need for coupon rationing for 85 per cent. of the households in the country consuming coal.

Penalties for Excess Consumption

The gas and electricity undertakings should be authorised to announce to their customers that as from a fixed date they would be required to reduce their consumption to, say, 80 per cent. of that of the corresponding quarter of the previous year. They would then be charged for this 80 per cent. on the existing basis; if there were an excess there would be a penal price per unit or therm—it might be 2s. 6d. or 5s. per unit and 10s. or 15s. per therm. If a serious offender repeated his excess consumption in the second quarter his supply would be cut off. He would exclude from the proposals all consumers whose consumption was less than 200 units (or 1,400 units where electricity was used for cooking) or less than 100 therms where gas was used for cooking. He was told that in the case of gas this would wipe out about 50 per cent. of the consumers who would otherwise have to be assessed and in the case of electricity some 35 per cent.

The speaker claimed that his scheme would drastically reduce the number of assessments which would have to be made and relieve housewives of the harassing calculations which would be inevitable under the Beveridge scheme. He considered that it would have less effect upon the morale of the people than the proposals put forward by the Government.

Mr. Ivor Thomas expressed approval of the Beveridge plan and criticised that proposed by Sir Arnold Gridley as placing control in the hands of private interests. He saw no difficulty in the reading of meters by consumers.

"A Light-hearted Attempt"

Sir John Wardlaw-Milne, chairman of the Select Committee on National Expenditure, spoke of the Government's failure to implement the recommendations of that Committee. He described the Beveridge scheme as a light-hearted attempt to deal with a serious subject. After reading the report he came to the conclusion that Sir William Beveridge was against rationing but that this was the best way to do it if the Government forced it upon him. The report was far more full of the difficulties of the scheme than of anything else. After mentioning still further objections to the scheme, Sir John concluded by urging the Government before adopting any scheme at all to make an appeal for the co-operation and help of the people.

Flight-Lieut. Challen said that in his constituency (Hampstead) thirty or fifty additional meter readers and clerks would be required when expert meter readers could not be obtained. The Beveridge scheme was impracticable and an appeal to the country would produce better results. Mr. Jewson also maintained that the Government should postpone rationing until it was seen what could be done by free will and good will.

On the other hand, Mr. Frankel welcomed the scheme as being the fairest to the majority of the people, and Mr. Clement Davies considered that only by such means could equitable distribution be ensured. Mr. Coigate, while urging greater production of coal, asked if the Beveridge scheme, with modifications suggested by Sir Arnold Gridley, could not be applied only to houses of a certain standard.

Sir Herbert Williams said that although he did not like Sir William Beveridge's proposals he was not convinced that Sir Arnold Gridley's were right either, for both involved a great deal of costly administration. He, too, blamed the Government for ignoring the reports of the Select Committee, and referred to the "truce" between the gas and electricity supply industries. He said that it was unfair that those industries should be attacked for drawing attention to the fact that the Beveridge scheme was wasteful of man-power and material. He illustrated by examples the possible complications of the scheme which, he maintained, would have to be applied to 14,000,000, not 12,000,000 premises. He advised the President of the Board of Trade to drop the scheme which he (the speaker) was certain would not work.

Clerks or Miners?

Mr. W. J. Stewart did not think that the scheme would produce adequate results; these could only be obtained by attention to the coal industry. Mr. Liddall, while agreeing that the idea of fuel rationing was sound in itself thought that the difficulties involved in the coupon proposals rendered them unworkable. He, too, urged that miners should be brought back to the industry and replaced by the potential clerks required for the scheme.

Several other members dealt with the necessity of reorganising or rehabilitating the coal industry as the only way of meeting the apprehended shortage, and the debate was wound up by Sir Stafford Cripps, who claimed that there was general agreement that saving of fuel was essential. Apart from that it was agreed that a fair scheme of distribution of a commodity likely to be in short supply should be arranged in advance. The Government was not prepared to rely upon the good will of some individuals in order to bring about a saving. He criticised Sir Arnold Gridley's proposals as unlikely to operate satisfactorily for a number of reasons although he promised that they would be considered.

He concluded by saying that a White Paper would be issued containing the scheme which it was proposed to operate. Then if there was any large measure of opposition there would be a further debate before Whitsun.

Unexamined Electric Hoist

ISAAC Spencer & Co. (Aberdeen) Ltd., paint manufacturers, were fined £5 at the Sheriff Court on May 1st for a contravention of the Factories Act, 1937. The charge was that the electric power hoist in the factory had not been examined by a competent person within the six months preceding April 7th.

Insulating Oils

Various Aspects Discussed at the I.E.E.

A SYMPOSIUM of five papers treating liquid dielectric media from different points of view was presented before the Transmission Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on Wednesday last.

Messrs. A. W. Thompson (Dussek Bros. & Co., Ltd.) and J. C. Wood-Mallock (Lobitos Oilfields, Ltd.) jointly described the selection of crudes and the choice of refinery methods best suited to the manufacture of various kinds of oil for transformers and circuit-breakers, as well as oil-rosin for saturating condensers and cables by impregnation. The scope of their single paper prevented the presentation of more than a small fraction of the available experimental evidence in support of statements made.

Highly paraffinic oils are undesirable in transformers and cables, or condensers, subjected to continuous electrical stress; it follows that solvent processes are unsuited, in general, to the refining of oils for those purposes. In discussing methods of testing oils consideration is given to the changes that liquid dielectrics undergo under high electrical stress.

Hydrogen generation, or absorption, under stress in conjunction with power-factor determination is considered to be the most informative test to which any impregnant can be subjected. Its importance was first emphasised in hollow-core cable, but the authors believe that it can profitably be extended to the examination of all cable and condenser saturants. They have used several kinds of apparatus for the examination of "gassing" and have now standardised their own design, which has been developed from an earlier Pirelli method.

The conclusions are that revision of B.S.S. 148 is overdue; any oxidation test should take into account the development of acidity as well as sludge, and should be carried out at a lower temperature. Solvent treatments lend themselves to the production of transformer oils, but the distillate must be suitably chosen for the purpose. The production of carbon in switch oils during arcing needs to be further investigated in relation to refining.

Transformer oil is not ideal for saturating condensers; for which purpose judgment should be based on dielectric loss and stability to ionic bombardment. Condenser saturants are best produced by sulphuric acid treatment of a naphthenic distillate, which may be of reasonably high viscosity.

The oil component of impregnating media for solid-type cables should be assessed on power loss, particularly at high temperatures, and freedom from gas formation under stress. A suitable oil is preparable from a viscous vacuum distillate from a naphthenic, or intermediate, crude by sulphuric acid refining; solvent processes are not suitable. Rosin is a desirable constituent because of its effect on gas formation and cable stability, and should be chosen with regard to its effect on dielectric loss.

Impregnating Behaviour

The paper by Mr. S. Beckinsale (Callender's Cable & Construction Co.) describes the behaviour in impregnating plant of those oils, paraffinic and naphthenic, which are at present available in this country for insulating cables; either class may be used in oil-rosin compounds. The use of naphthenic oils is increasing rapidly, because they are the better solvents of rosin and oxidised substances produced therefrom, since oil and refined resin compounds have advantages over those containing unrefined gum rosins. For voltages above 66 kV either a thin naphthenic oil is used for so-called oil-filled cables, or a viscous naphthenic oil sometimes containing a viscous hydrocarbon polymer is the saturant for pressure-type cables.

Cable oils should be resistant to "gassing," lest they be subjected to electrical discharge during service. Therefore both British and American refiners leave in certain aromatic constituents which absorb any gas that may be generated under electrical stress from the more saturated compounds in the oil. Solvent-refined naphthenic fractions are suitable for cables, but solvent-refined paraffinic fractions are not, because of their failure to absorb gas and the physical instability of the rosin compounds made with them.

The reasons for the practically universal employment in this country of oil-rosin compounds for impregnating cables above 66 kV is their readily obtainable greater viscosity combined with their good adhesion to paper fibre. Twenty years ago a pioneer British cable manufacturer developed papers made from conifer cellulose and that kind of wood pulp paper has now become almost universal for power cable insulation.

Further improvement is largely a problem for chemists and physicists, with electrical engineers working out fresh methods of testing as dielectric losses are reduced.

Explosive Failures

Insulating oil in relation to circuit-breaker failures is the subject of the paper by Mr. W. Fordham Cooper (H.M. Electrical Inspector of Factories) who has investigated many

accidents and dangerous occurrences due to the explosive failure of oil-immersed control gear. Not all have been caused by inadequate rupturing capacity, or defective insulation, particularly in cases of control gear for electric arc furnaces. The present paper is an attempt to assess what part deterioration of the switch oil may play in such failures. The importance of this matter may be judged from the fact that oil in such switches is changed every two or four weeks, even weekly in some works.

An endeavour is made to classify the different kinds of explosion that may occur so as to provide a framework into which observed damage can be fitted, and to correlate the data with fundamental research into the ignition of oils and vapours. The paper has no direct bearing upon arc control, or rupturing capacity.

Many engineers responsible for the maintenance of switchgear have felt that while the tests laid down in British Standard Specifications may eliminate many new oils that are definitely unsuitable, they do not provide a certain guide to the rejection of used oil after a period of service. The author has therefore suggested initial tests. The subject is one about which there is little agreement among experts. Failures in service of switches subject to frequent routine operation are often very different from those produced at various short-circuit testing stations. Lines of investigation should be simple to meet works routine application.

If, as seems certain, explosions occur occasionally without previous insulation breakdown, or severe arcing, their occurrence needs to be correlated with some definite condition of the oil, or the switch, in two parts: first in respect of surface contamination and the associated presence of suspended matter in the oil and, secondly, in respect of general chemical deterioration. Fortunately explosions are rare, though not so infrequent as to be unimportant. At present the problem is somewhat like looking for a needle in a haystack without being certain what the needle itself looks like. The author's endeavour has been provisionally to specify the " needle."

Mineral Oils

The contribution of Mr. A. A. Pollitt (Metropolitan-Vickers Electrical Co., Ltd.) shows that in spite of the introduction of liquid chlorinated hydrocarbons, which are non-inflammable, mineral oil still remains the chief fluid for filling transformers and switches. It serves the dual function of insulating and cooling medium, the outstanding characteristic determining its choice being stability in service and its inertness towards solid materials immersed in it.

In discussing the evaluation of properties and the significance of B.S.S. 148 tests, the author remarks that it is often difficult to determine precisely the degree of acidity of an unused oil, so small is the amount present. He doubts whether saponification tests are of much value in the case of new oils, as other tests would disclose unsuitability. Sludge, or oxidation, tests may be regarded as the linchpins of all insulating oil specifications, but dissatisfaction is reflected in the frequency with which modifications are suggested.

In fairness it must be admitted that it is not simple to estimate and compare the resistance to, and rates of, oxidation; particularly by tests designed to furnish this information in the minimum of time for acceptance purposes, the results of which have to be translated into terms of actual service behaviour over long periods. No entirely satisfactory method has been evolved.

The maintenance of an oxygen-free atmosphere inside transformers, by sweeping out the air above the oil with an inert gas and then hermetically sealing them with an expansion device, or maintaining a slow trickle of nitrogen gas through the transformers, would eliminate all sludge and acid formation and their attendant troubles; so that less highly refined and therefore cheaper oil could be used, enabling a single grade to be more readily standardised. Such procedure had been considered by the Electrical Research Association before the present crisis, which has temporarily forced the adoption of one grade of oil instead of two.

Oil Reconditioning

Maintenance tasks are dealt with in a paper by Mr. L. H. Welch (Central London Electricity, Ltd.) who suggests that of the six oils of the same viscosity mentioned in B.S.S. 148 only grade B.30 should be retained. Revision of that specification should provide for the inclusion of oil of greater viscosity for switchgear.

Routine tests for sludge and moisture contamination are universal, but acid value may be important and flashpoint has to be determined occasionally. Suggestions are made as to what values should be permitted before purification is considered necessary. Types of contamination likely to occur are discussed, together with available reconditioning apparatus and methods of treatment. Suitable maintenance periods are tabulated; the periods being dependent more on the immersed gear needing attention than on the oil, since it is difficult to handle the latter or work on gear immersed in it without causing deterioration.

The author concludes with advice on ways and means of minimising maintenance. Cold purification is much to be preferred and he considers filters to be generally more useful and easier to operate than centrifugal purification machines.

Education and Training

I.E.E. Discussion Concluded

FOLLOWING the annual general meeting of the Institution of Electrical Engineers on May 7th discussion was resumed of the paper presented by Dr. A. P. Fleming (for the Education, Training and Personnel Sub-Committee of the Institution's Post-War Planning Committee) which had been adjourned on March 19th (see ELECTRICAL REVIEW, March 20th, p. 367, and March 27th, p. 401).

Dr. P. Dunsheath (Henley's) said that during the last two or three years this country had lost an annual income of £200,000,000 through the gradual disappearance of foreign assets. It was therefore necessary to build up, and the sooner the better, a very considerable national asset to straighten out the unbalanced situation, and the education of personnel in industry was the most promising way of doing it. Moreover, it was important to raise both the intellectual attainments and manual skill of a declining population in order to hold our own in foreign competition. There were works managers who thought it was against the interests of the shareholders to let young people have time off for training, but no concern could possibly lose by making such a concession. Industry had a tremendous opportunity in this matter and it should not look to the Board of Education for guidance; the electrical industry should take the lead.

Sir Frank Gill said that in many cases the engineer was concerned with the wise handling of money in a trustee capacity. He was spending money for other people and therefore must spend it wisely. Unless engineers were taught in the economic sense they could not call themselves engineers. In other words, the engineer must know where to stop in his efforts to secure the greatest efficiency.

Selecting the Right Type

Mr. E. S. Byng (Standard Telephones & Cables) discussed selection and vocational training, and said that the Institute of Industrial Administration for many years had been endeavouring to persuade the colleges to take up the training of foremen. The war had caused the Board of Education and the Ministry of Labour to tackle this problem seriously and training was being given to foremen in the supervision and handling of labour without, of necessity, knowing a great deal about the technical side. This involved selection, but hitherto there had been no specification as to the selection and testing of that raw material. A little was being done under the National Institute of Industrial Psychology, but, generally speaking, the importance of it had not been appreciated here as it had been in America and Germany. If the employer was to get the right type, the management should be watching the development of the young people in the organisation and so get the right men into the higher positions.

The Government was now encouraging employers to release staff for a certain time each week, and he believed that after the war employers would be willing to release members of their staffs for two days a week to enable them to take the National Certificate courses in the day time. It was important there should be some provision for men to be taken out of industry to give part-time teaching, and in America arrangements were made for full-time teachers in universities and technical colleges to go back into industry every six or seven years.

Junior Technical Schools

Mr. C. W. Robson (South-East London Technical Institute) said that there should be a still further expansion of the junior technical schools from the engineering point of view. In 1937–8 the new entrants to engineering schools as a whole were 37,000, but the electrical engineering industry claimed only 7,830. In that year the output from 42 junior technical schools for engineering as a whole was only 2,600 and the proportion entering the electrical industry was only 600, and figures from 23 junior technical schools showed that from 60 to 70 per cent. of the boys leaving them remained in craft work, which seemed to be an opposite result from that stated in the paper.

Wing-Commander T. B. Cave-Brown-Cave (Institution of Mechanical Engineers) hoped that the Educational Committees of the major Institutions would work together and get some clear definition of what was actually required. Undoubtedly it was industry which must define the requirements and industry must depend on the various Institutions to make that process possible and organise it. There was a need to define university education, to indicate the contribution which the Institutions and the industry could make in laying down what was actually required, and finally to comment on the part the university would play in meeting these requirements. The normal source of supply of students for the university course would be from the schools, and there was a good deal to be said for these students going to works half time—not part time—for two years, one day in the works and one day in college. Then the student should take a further two years

getting an ordinary engineering degree, and those who did sufficiently well would go on to the honours degree in civil, mechanical or electrical engineering devoting another year to that. The functions of the Institutions should be to lay down what subjects should be included in the ordinary degree and the university would decide how much it was possible to get into two years.

Mr. M. W. Humphrey Davies (University College, Bangor) said it was necessary to make up our minds on those steps which required more concerted effort, and two which had been mentioned in the paper were the training of trade apprentices, and the training of the university graduate after he had his degree. Having visited certain schools on the Continent and in the United States which had been working on these lines, he had been most impressed with the results, as regards craftsmen. He agreed that after getting his ordinary degree, the student should go into industry and take some sort of apprenticeship course, after which he would have to decide which type of engineering works he wished to enter and whether on the commercial, manufacturing or research side

Adequacy of Teaching Methods

Dr. Winifred Hackett (E.R.A.) drew attention to the lack of any desire on the part of the teaching profession to research into the adequacy of their own teaching methods and the adequacy of the educational framework based on the experience of past students. After the war a large number of women who had received some training in engineering would wish to remain in industry and facilities for further training should be provided in post-war planning for those who possessed the ability to take advantage of such training.

Dr. J. Greig (Northampton Polytechnic) thought that, generally speaking, university courses produced a type of man potentially capable of taking up research or manufacture or the supply side, and did not cater for the many other classes. It was worth while considering the advisability of providing separate university courses, perhaps in the final year, for men in the different categories. This might call for a pre-selection of the students, but that was not impossible.

Mr. F. E. Rowland (General Electric Co.) said that modern technical education tended to produce experts with a narrow outlook. If electrical engineers were to take an adequate part in dealing with political and social problems their education must be on liberal lines with training in politics, economics and industrial management. He suggested that one or two Informal Meetings of the Institution might be devoted to such subjects.

Mr. W. C. S. Phillips (Borough Polytechnic) said that the majority of the youth of the country would never go to a university, but they had to be trained and the cure for the falling off in the number of students entering for the National Certificate course which involved evening training was to have part-time day courses. In this matter the co-operation of the employer was essential.

Dr. R. W. Sloane (General Electric Co.) thought that instead of industry itself educating its young people it would be better to pay the Board of Education to run proper schools for this purpose. How boys and girls were to be provided for these schools was a difficult problem and perhaps the elementary school authorities would have to assist in the selection.

Post-War Congestion

Mr. F. de la C. Chard (Bristol University) said that after the last war there was a rush at the universities and technical colleges which severely overloaded them with all sorts of people from the Services who probably wanted a three years' change from their previous work. This time there must be careful pre-selection of personnel for full-time technical training after the war.

Dr. Fleming's reply consisted mainly of a brief summary of what had been said by the principal speakers in the two discussions. He emphasised the point, however, that the paper had been prepared by a sub-committee of the Planning Committee and he was merely its mouthpiece. As to co-operation between industry and the universities and technical colleges, he said that there was a need for the education of industrialists before they accepted some of the views that had been put forward.

The whole discussion would receive careful consideration and he thanked the members for the great interest that had been taken in the paper, at the same time expressing the hope that further contributions to the discussion would be made in writing.

Forthcoming Events

Institution of Electrical Engineers.—*North Midland Students' Section.*—Saturday, May 30th, 2.30 p.m. Hotel Metropole, King Street, Leeds. Annual meeting.

Association of Mining Electrical & Mechanical Engineers.—Saturday, May 16th. South Wales Branch annual meeting.

Institute of Physics.—Wednesday, May 20th, 2.30 p.m. Royal Institution, Albemarle Street, W.1. Inaugural meeting of Electronics Group. Discussion on "Amplifiers for Measurement and Control," to be opened by Mr. C. A. A. Wass.

Electrical Association for Women.—Thursday, May 21st, 2 p.m. Institution of Electrical Engineers, Savoy Place, W.C.2. Annual conference.

Junior Institution of Engineers.—Friday, May 22nd, 7.30 p.m. Royal Institution, W.1. Ninth Quadrennial Gustave Canet Memorial Lecture: "Scientific Research and Development in the Empire," by Prof. A. V. Hill, F.R.S., M.C., M.P.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Incendiary-Bomb Detection

IN his letter, published in your issue of May 1st, Mr. Burke stated that the point of general impact was investigated during the original experimental work. To the best of my knowledge, investigations were carried out also by the Ministry of Home Security, the British Standards Institution and the then Fire Prevention Executive, and these bodies came to the conclusion that it was undesirable to record impacts other than those which would give rise to a fire risk. It would be serious if the attention of fire-fighters were diverted, by alarms due to pieces of concrete, from incendiary bombs falling in other parts of the factory.

What authority calls for the requirements detailed in the first paragraph of Mr. Burke's letter and wherein lies the advantage of knowing when bodies other than incendiary bombs penetrate the roof? My experience and that of my colleagues in examining the implications of incendiary bomb raids is that single-mindedness of purpose in individuals is one of the most successful attitudes with which to tackle fire bombs. The same objectiveness in automatic equipment is also desirable. Surely the ideal incendiary-bomb detector will detect nothing but incendiary bombs.

With regard to Mr. Burke's concluding sections, I would make the following comments:—

(*a*) Experience has shown that connections to the mains are quite practicable, and that the installation of batteries is both unnecessary and impracticable. Connection to the mains, of course, involves a closed-circuit system.

(*b*) The working of any system, photo-electric cell or any other, must depend on its being properly planned. It is no good putting a detector in a section of the building which will not contain an incendiary bomb.

(*c*) Depending on the reflection factors of walls, each detector cell will cover an area of between 8,000 and 10,000 sq. ft.; under these conditions a great number of cells is not needed for a building.

(*d*) Testing a light-sensitive detector installation is not only simple but also dovetails in with the statutory routine duties of the fire-watching personnel.

(*e*) The speed of impact of a 2-lb. incendiary bomb dropped from 10,000 ft. will be such that the advantage of impact devices will be only between one-fiftieth and one-hundredth of a second.

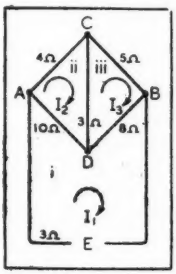
Automatic detection of incendiary bombs can solve many of the problems which arise from the Fire-Watching Order. The systems used, however, must be selective and must not under any circumstances call fire-fighters into action for anything but a fire hazard.

*London, E.C.*4. J. MORTIMER HAWKINS.

Network Calculations

WITH reference to the article on "Network Calculations" by Dr. T. F. Wall, which appeared in your issue of November 7th, 1941, and to the letter in the issue of November 28th, from Mr. T. K. A. Douglas, as a telecommunications engineer I am only too anxious to give full credit to Thévenin's theorem, knowing its value and utility in communication circuits.

I would, however, prefer for its interpretation the classical method and formula, using fig. 4 of the article as an illustration, instead of fig. 1 which, I am afraid, would appear rather sophisticated to those not intimately acquainted with the subject.



Referring to the accompanying diagram, if, prior to connection of the resistance in the branch AC, V is the p.d. across AC (open) and R_1 the resistance of the circuit between these two points, then the current (steady state) flowing through the resistance R_2 (4Ω) in the branch AC when connected to the junction points AC will be

$$I_{AC} = \frac{V}{R_1 + R_2}$$

Its importance and utility lies particularly in the fact that in addition to the simplification it affords in determining receiving efficiencies and transmission losses in communication circuits, by enabling us to reduce any complicated structure to a simple series impedance, it also enables us to determine currents and voltages in any branch, from measurements between the junction points of that particular branch, without knowing the voltage and current conditions at the distant transmitting point.

Nevertheless, for the calculation of the current in branch AC of Dr. Wall's fig. 4, I would use neither Thévenin's theorem nor the method advocated by Mr. Douglas. In my opinion, the simplest and most straight-

forward method for the determination of currents in any branch of a complex circuit is best afforded by the determinant method using circular mesh currents.

In our particular case, we have the following loop resistances $R_{11}=21$ ohms, $R_{22}=17$ ohms, $R_{33}=16$ ohms and mutual resistances $R_{12}=R_{21}=-10$ ohms, $R_{13}=R_{31}=-8$ and $R_{23}=R_{32}=-3$; hence current in branch AC=

$$I_{AC}=\frac{\begin{vmatrix}21 & E & -8\\ -10 & 0 & -3\\ -8 & 0 & 16\end{vmatrix}}{\begin{vmatrix}21 & -10 & -8\\ -10 & 17 & -3\\ -8 & -3 & 16\end{vmatrix}}=\frac{E_1 M_{12}}{D}=\frac{E(-184)}{2355}$$

For E=100 volts and $I_{AC}=-\frac{18400}{2355}=7.812$ amperes the same result as is obtained by the other methods.

The negative sign indicates that the current will be flowing in the opposite direction to that arbitrarily chosen.

Haifa, Palestine. Z. FRIEDBERG, A.M.I.E.E.

Consequential Injury

REGARDING Mr. Gilbert's letter in your issue of May 8th, there are two methods of proving this point of the split-second shock whilst the trip operates or the continuous shock if it fails to do so: (a) by practical demonstration, and (b) by academic or theoretical explanation.

I think Mr. Ringer, who kindly consented to be the "patient" or "subject" at the Supervisors' meeting, will testify to the effectiveness of the practical method. The theory of the point is explained in fig. 5 of the paper or briefly in words as follows:—

Assume full-voltage fault conditions and 230-V apparatus in each case. With the trip connected in the earth lead, the potential difference between the appliance frame and true earth is 230 V, whether the electrode resistance is zero or as high, say, as a figure equal to the coil impedance. This voltage exists for 0·1 sec. if the trip operates or continuously if it fails to function.

With the trip connected as described, the potential difference between the appliance frame and true earth is zero volts if the electrode resistance is zero or the voltage minimum of 57 V if it has a value equal to the coil impedance. This substantial difference is fundamental and is not materially affected by the separation of reactive components of leakage currents.

The use of transformers with "unearthed" secondaries in ordinary situations is not advisable in my opinion for the reasons described in the paper.

Slough. F. E. BUTCHER.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AT the special request of the Gt. Yarmouth Corporation, **Mr. Percy E. Rycroft,** who had intended to retire at the end of August next, has agreed to retain his position as chief engineer and general manager for a further twelve months.

Mr. A. F. E. Evans, district manager, Egyptian State Telegraphs & Telephones, Alexandria, has been awarded the O.B.E. for his services in meeting the heavy demands of the Imperial Forces for signal communications in the Alexandria area.

Mr. I. H. Mair has been chosen as chief assistant to Mr. D. P. Martin, the recently-appointed chief engineer to the Nottingham City Transport Department. Since January, 1941, Mr. Mair has acted as technical assistant.

Mr. A. G. Lang, of Siemens Brothers & Co., Ltd., has joined the staff of Elliott Brothers (London), Ltd., as manager of measuring instrument sales.

Mr. W. D. Lovell, special technical assistant in the City of Bradford Electricity Department, has been presented with a clock by his colleagues on his leaving to take up the appointment of deputy borough electrical engineer of Sunderland. In making the presentation, Mr. W. Dundas, electrical engineer and manager of the Bradford undertaking, spoke appreciatively of Mr. Lovell's services and expressed the best wishes of the staff for his success and happiness in his new post.

An informal luncheon of the Meter and Instrument Section of the Institution of Electrical Engineers was held at the Holborn Restaurant on May 8th. Mr. W. Phillips, chairman of the Section, presided and briefly expressed his pleasure at the good attendance, the guests including the chairmen of the other technical sections of the I.E.E. as well as its president. Sir Noel Ashbridge proposed the chairman's health. In acknowledgment Mr. Phillips expressed regret at the absence, due to a broken leg, of Mr. G. F. Shotter who had done so much for the Section. A telegram was sent wishing Mr. Shotter a speedy recovery.

Last week Derby Town Council rejected a recommendation that it should adopt the scale of salaries agreed upon by the Joint Committee of Local Authorities and Chief Electrical Engineers for the Electricity Supply Industry. It was stated that the scale would mean that the salary of the borough electrical engineer and manager, **Mr. F. H. Pooles,** would be £2,000 a year by 1950, or £700 to £800 more than that of the Town Clerk. When the position was advertised it was stated that a salary in accordance with a certain scale to be laid down would be paid. Under the scale subsequently agreed by the Joint Committee, Mr. Poole's salary

would be increased in the initial stages by annual increments of £100 to £1,400, as from July 1st, 1941, the date of the signing of the agreement, which, according to the present activity of the undertaking envisaged a limit salary of £2,000. Alderman A. Sturgess contended that there was an agreement and it was a point of honour to carry it out.

Mr. M. G. Bland, O.B.E., M.Inst.C.E., A.M.I.E.E., and **Mr. H. Bourne,** M.I.E.E., M.I.H.V.E., M.Cons.E., have dissolved their partnership (Albion T. Snell and Partners) and each is now carrying on the practice of consulting engineer in his own name. Mr. Bland's wartime address is 36, Chartfield Avenue, Putney, London, S.W., and Mr. Bourne's address is 32, Berwyn Road, Richmond, Surrey.

Mr. J. Morton, chief engineer to the West Midlands Joint Electricity Authority is retiring in September, and **Mr. L. F. Jeffrey,** at present deputy engineer, has been appointed to succeed him as chief engineer.

Mr. Morton served an engineering apprenticeship with James & George Thomson, Ltd. (now John Brown, Ltd.). From 1900 to 1905 he was with the Cunard Steamship Co., with whom he obtained a first-class Board of Trade certificate

Mr. J. Morton

Mr. L. F. Jeffrey

He left the Cunard Co. to join C. A. Parsons & Co. at Heaton and for eighteen months was in the steam turbine testing department. His next appointment was with the Lancashire Electric Power Co., at the Ringley Road, Radcliffe, generating station and eighteen months later he joined the construction department of the British Thomson-Houston Co., Ltd., who were the main contractors for the Ringley Road station, and proceeded to Leeds to take charge of the erection of the vertical turbo-alternator sets for the supply of h.v. energy to the Leeds Corporation tramway substations. On completion of the Leeds contract in 1907 he entered the service of the Paisley & District Tramways Co. as mains and permanent way superintendent.

He returned to the B.T.H. in 1911 and went to Malta to take charge of the installation of the plant in connection with the wireless station installed by that company for the British Admiralty. On returning to Rugby he was appointed chief assistant to the company's construction department. Mr. Morton joined the Birmingham Corporation Electricity Department in 1918 where he remained until 1927, when he was appointed transmission assistant with the West Midlands J.E.A., later becoming chief assistant engineer. He was appointed chief engineer in 1938 in succession to the late Mr. E. F. Hetherington.

Mr. L. F. Jeffrey, B.Sc. (Eng.), was educated at Whitgift School, Croydon, Battersea Technical College and London University. He obtained practical training with James Keith & Blackman Co., Ltd., London and Arbroath, N.B., and during 1914-18 served in the Royal Navy in H.M.S. *Warspite* in the Grand Fleet. For three years he was assistant engineer on the staff of Mr. T. Hardie, M.Inst.C.E., formerly chief engineer of the Gas Light and Coke Co., and for eleven years he was assistant design and constructional engineer, City of Birmingham Electric Supply Department. In 1936 he was appointed technical assistant and constructional engineer to the West Midlands J.E.A., and has superintended important extensions of the authority's undertaking. He is a member of the Institutions of Civil, Mechanical and Electrical Engineers.

Mr. J. H. Steward, charge engineer at Blackburn power station, is retiring on superannuation in July, after over forty years' service in the municipal electricity supply industry.

Mr. E. S. Booth, A.M.I.E.E., of the Yorkshire Electric Power Co., has been appointed technical and constructional assistant to the Luton Electricity Department at a salary of £536 per annum, rising to £556.

Mr. A. J. Nicholas, formerly sales manager with Ferguson, Pailin, Ltd., is reported by the *Electrical Power Engineer* to have taken up the position of general manager of the South Wales Switchgear Co.

Mr. William Hill, who has been elected chairman of the Hebburn-on-Tyne Urban District Council, is cashier at A. Reyrolle & Co.'s works.

Presentations were recently made, on their retirement, to **Mr. M. Cable,** general manager of the Wellington (N.Z.) Transport and Electricity Departments, **Mr. H. Leah,** rolling stock superintendent, and **Mr. A. Willcox,** electrical inspector.

To commemorate **Alderman Mrs. Gregory's** year of office as Mayor of West Ham, the Dowager Lady Swaythling, president of the Electrical Association for Women, on Tuesday presented to the borough, for the duration of the war, an electrically-driven canteen for which the members of the Association subscribed and which has already been operating in West Ham, taking refreshments to demolition workers and feeding the dockers. Mrs. Gregory is a former chairman of the E.A.W.

Obituary

Mr. F. Huggins.—The death has occurred, at the age of seventy-eight, of Mr. Frederick Huggins, a director of the Britannia Tube Co. and for many years a director of Simplex Conduits, Ltd.

Wills.—**Mr. J. Priest,** director of F. & C. Osler, Ltd., and Osler & Faraday, Ltd., left £11,156, with net personalty £7,556.

Sir J. P. Hewett, a director of the General Electric Co., Ltd., and other companies, left £19,950 (net personalty £16,682).

The late **Sir William Bragg,** O.M., K.B.E., F.R.S., left estate valued at £27,039 (£25,291 net personalty).

COMMERCE and INDUSTRY

Welded Cutting Tools. *St. Helens Salary Revised.*

Limitation of Space Heaters

ELECTRIC and gas space heating appliances of a kind used for domestic purposes are brought into the scope of the Limitation of Supplies (Miscellaneous) Order as from June 1st. The supply of these goods will be restricted to a rate of 25 per cent. by value of the amount supplied during the standard period of six months ended November 30th, 1939. Applications from manufacturers for registration in the new class should be sent by May 23rd to the Industries and Manufactures Dept. IV, Board of Trade, Carlton Hotel, Bournemouth.

The restriction period is from June 1st to July 31st and registered persons will be required to restrict their supplies in the two months to 8¼ per cent. by value of the corresponding supplies in the standard period. No account is taken of goods supplied to other persons registered in the same class, goods supplied to, or for the execution of contracts for, a Government Department, goods directly exported by the registered person or his agent and those supplied to certain organisations, etc., such as the British Red Cross Society.

Extra Clothing Coupons

Mr. L. C. Penwill, the Director of the Electrical Contractors' Association informs us that the Board of Trade has decided that the following classes of worker shall receive fifteen extra clothing coupons :—Men engaged in the replatal and maintenance of batteries ; electricians and mates ; maintenance electricians and mates ; cable jointers and mates ; plumber cable jointers and mates ; and battery attendants. Employers should apply immediately on Form E.D. 272 to the local office of the Ministry of Labour.

Supply of Rubber Cables

Cable makers have been instructed by the Ministry of Supply not to accept further orders for t.r.s. cables and flex unless they bear the endorsement of the Government Department concerned ; this will only be given when it is shown that no other type would be satisfactory. Where, in an exceptional case, a particular Government Department cannot be approached for approval the order should be submitted for endorsement to the Cable Planning Officer of the Ministry of Supply.

Equipment for Canteens

The Ministry of Works and Buildings' new schedule of cooking appliances (H.M. Stationery Office, 1s.) for use by Government Departments ordering equipment for new British Restaurants and canteens for schools, pitheads and factory workers considerably reduces the number of designs, types and sizes approved in September, 1941. It includes all the equipment necessary for canteen kitchens in wartime: appendices covering kitchen machinery and fittings, tea-making appliances and portable equipment, will be published shortly.

Economic design is a feature of the ovens, ranges, boilers, etc., described in the schedule, ornamental types being rigidly excluded. The use of all materials in short supply, particularly non-ferrous metals, has been minimised, and each item in the schedule has been made as light as is consistent with its purpose and durability. Where practicable metal feet, legs or stands will be replaced by brick or concrete piers. Air-drying black paint is used in preference to enamel or other elaborate external finishes.

Simplification of design, and the reduction in number of types and sizes ensures rapid production by a number of manufacturers with a minimum of labour, thus reducing war damage risks, transport and other wartime difficulties. Progress is not restricted, however, for improvements may be made by manufacturers within the limits of the specifications. All appliances and materials used must be in accordance with British Standard Specifications, Home Office Regulations and the Institution of Electrical Engineers' Regulations for the Electrical Equipment of Buildings.

Mutual Aid Scheme for Manufacturers

However well organised a firm may be, there are times when production is held up for want of perhaps a few bolts and nuts or other small components. Although these requirements are available somewhere it is not always possible for the user to know just where. Realising this need, the Ministry of Supply has recently put into being a mutual aid scheme aiming at locating surplus material and notifying the firm needing it. Already excellent co-operation and support have been achieved in the Birmingham and Manchester districts, where the scheme was launched, so that the Ministry has decided to extend the scheme to other industrial regions.

Until such times as firms are approached, those having surplus stocks of such stores and those firms who are in need of similar parts, are asked to communicate with the Regional Disposals Officer, Ministry of Supply, at the C.M.L. Building, Birmingham, or Britannia House, Manchester.

Saving by Welding

The Control of Machine Tools (Cutting Tools) (No. 2) Order forbids the use of high-speed steel as shanks for cutting tools. To assist works managements in meeting the requirements of the Order the Machine Tool Control has prepared an illustrated folder (M.T.C. Leaflet No. 2) showing how tools can be made up by the welding of high-speed steel cutting portions to medium carbon steel shanks. It is pointed out that the art of electric flash butt welding has been employed for this purpose for many years now in the cases of drills, reamers, end mills, slot drills, tee-slot and keyseating cutters and lathe tools. Their strength and efficiency have not been affected in any way and a saving of as much as 50 per cent. of high-speed steel has resulted.

The practice described is based on the methods of four important manufacturers of cutting tools, one of whom saves at least 250 tons of high-speed steel annually by these methods. Preparation, welding, normalising and annealing are dealt with. Firms who do not possess the necessary

equipment are asked to communicate with the Controller of Jigs, Tools and Gauges, 35, Old Queen Street, London, S.W.1, for particulars of the welding capacity set up to deal with this work.

Distribution of Broaches

At the request of the Controller-General of Machine Tools, the Coventry Gauge & Tool Co., Ltd., the Lapointe Machine Tool Co., Ltd., and Weatherley Oilgear, Ltd., have set up a Broach Allocation Centre at White House, 111, New Street, Birmingham, 2, to which any person desiring to order broaches from any of these companies should send full particulars of requirements on form B.A.C. 2 accompanied by any necessary drawings. In due course the applicant will be notified of details of price and delivery.

Paper Salvage Example

The London Passenger Transport Board has set a good example in its response to the appeal for greater efforts in the salvage of waste paper. Records dating back over seventy years and mostly relating to absorbed undertakings are being pulped to assist the war effort. So far over 200 tons of ledgers, old files, records and office waste paper have been cleared out of the vaults and it is anticipated that eventually about 300 tons will be contributed in this way.

The Waste Paper Recovery Association is appealing to all business people to organise waste paper recovery in every office, shop and factory. It is suggested that someone should be appointed salvage officer and members of the staff invited to submit suggestions regarding economy in the use of new paper and increasing the recovery of waste.

Government Recognition of B.S.I.

The British Standards Institution has received a communication from the Minister of Production to the effect that the Government recognises the Institution as the sole organisation for the issue, in consultation with any Government, professional or industrial bodies concerned, of standards as having a national application.

With regard to the preparation and issue of codes of practice for building and civil engineering work the Minister of Works and Buildings is making special arrangements by the appointment of a representative committee with which the B.S.I. is fully co-operating.

Compulsory Disclosure of Scrap

Under the Defence (General) Regulations No. 56AAA the Ministry of Works and Buildings has called upon all occupiers of premises in certain areas to furnish a return of an accumulation of three tons or more of metal suitable for scrap, including parts of buildings, structures, machinery or plant which is disused, obsolete or redundant. The Order does not include aluminium, magnesium and alloys of these metals.

The areas from which returns are required are the London Civil Defence Region, the county boroughs of Leeds and Bristol and the counties of Essex, Dorset, Nottinghamshire, Monmouthshire and East, West and Mid-Lothian. Further areas will be scheduled in due course. Forms are obtainable from the Director of Demolition and Recovery (Scrap Metal Order), Ministry of Works and Buildings, Sanctuary Buildings, Great Smith Street, London, S.W.1, and must be returned within thirty days from May 14th.

The St. Helens Appointment

In March the St. Helens Council advertised for a borough electrical engineer and manager at a salary of £1,200, to succeed Mr. W. S. Johnston, who is retiring on account of ill-health. The A.M.E.E. and E.P.E.A. thereupon advised their members not to apply for the post as the scale salary was stated to be £1,428. Now the position is being re-advertised and the salary offered is £1,450 per annum.

Trade Announcements

The telephone number of Hogan & Wardrop has been changed to Holborn 1594.

The London office of the Igranic Electric Co., Ltd., has been transferred from Bush House to Victoria Station House, 189, Victoria Street, S.W.1.

The Manchester branch of Watson & Sons (Electro-Medical), Ltd., has been transferred to temporary accommodation at 23, Daylesford Road, Cheadle, Cheshire.

TRADE MARK APPLICATIONS

THE following applications have been made for British trade marks. Objections to any of them may be entered within a month of May 6th:—

GOSSTALLOY. No. B617,298, Class 6. Alloys not of precious metals.—Telegraph Construction & Maintenance Co., Ltd., 22, Old Broad Street, London, E.C.2.

OPHTHERM (design). No. 618,295, Class 10. Electrical apparatus for radiotherapy.—Theodore Hamblin, Ltd., 15, Wigmore Street, London, W.1.

PUL-SYN-ETIC. No. 618,293, Class 14. Horological instruments and parts thereof.—Gent & Co., Ltd., Faraday Works, St. Saviour's Road East, Leicester.

TEMPLEX. No. 617,563, Class 17. Electrical insulators of ceramic material.—Bullers, Ltd., 6, Laurence Pountney Hill, London, E.C.4.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

Address of Beaton British Electric Mfg. Co.

Electrical Man-Power

Technical Officers Required : Transfer of Personnel

A CALL has been made by the Central Register to the electricity supply industry, through the Electricity Commissioners, for men to take up technical commissions in the fighting forces, as well as a small number for Government research and development departments. The men needed are those with university degrees or the Higher National Certificate in engineering. It is proposed to obtain such men within the next two months from those who had not attained the age of 25 at the date of their registration for military service.

In a circular sent to supply authorities the Commissioners say that they are assured that men considered to be vitally necessary for the functioning of an undertaking will not be taken and that it is hoped to replace withdrawn men, at least in part, by graduates leaving the universities this year. The Electricity Supply Man-Power Consultative Committee has agreed that the request of the Ministry of Labour and the proposed arrangements are not unreasonable.

Accordingly supply undertakings have been asked to send immediately to the Commissioners particulars of personnel with the qualifications specified. Information, in duplicate, is asked for on the following points:—Name of employee and age when registered, or present age if not registered; occupational classification; salary or N.J.B. class and grade; brief particulars of qualifications and experience with an indication whether the employee is regarded as vital to the functioning of the undertaking.

The information will be passed, with the Commissioners' observations, to the Ministry of Labour and arrangements will be made for a representative of the Ministry to visit undertakings to interview the men concerned and their employers, to see if the men are suitable for commissions and to arrive at the number which may be withdrawn. In the case of smaller undertakings men may be asked to attend for interview at centres near their places of work.

Transfer of " Redundant " Employees

At the time of the setting up of the Electricity Supply Man-Power Consultative Committee the Electricity Commissioners were assured by the Ministry of Labour that the man-power of the supply industry, so far as operation and maintenance were concerned, would not be further depleted, and that, if vacancies existed, any redundant men should be transferred within the industry itself.

Men may become " redundant " by the rejection of applications for deferment by District Man-Power Boards with the concurrence of the Commissioners; by the decision of an undertaking not to apply for a man's deferment; and by the release of men owing to the falling-off in certain classes of work. With regard to members of the technical staff who may thus become redundant the Commissioners ask to be given particulars similar to those set out in the case of the men required for the fighting forces. At the same time undertakings are asked to notify the Commissioners of vacancies for technical staff which they find that they are unable to fill by promotion or re-arrangement.

As regards manual workers, the Ministry of Labour has indicated that it should be possible to place redundant men within the supply industry or elsewhere, if there are no vacancies in the industry. Supply authorities are therefore asked to send particulars of such men to the local office of the Ministry and at the same time notify the Commissioners, who are anxious to ensure that the men are not lost to the industry if there are suitable vacancies.

Deferment Arrangements

In some general observations the Commissioners say that the Consultative Committee has decided that normally it will not be prepared to support applications for deferment on behalf of men below the age of 25 at their registration, unless it can be clearly shown that the withdrawal of these men would seriously interfere with the efficient functioning of the undertaking.

Men under the age of 25 who possess university degrees or the Higher National Certificate are subject to a special review by the Ministry of Labour.

The Commissioners have circulated a list of employees (technical and manual) who have, or shortly will, become redundant and it is suggested that undertakings with suitable vacancies should endeavour to arrange transfers and notify the Commissioners of the results.

I.E.E. Premium Awards

THE Council of the Institution of Electrical Engineers has made the following award of premiums for papers read during the Session 1941–42, or accepted for publication:—*Institution Premium*, Mr. J. M. Meek. *Ayrton Premium*, Mr. J. S. Forrest. *Fahie Premium*, Messrs. W. G. Radley, Ph.D.(Eng.), and E. P. G. Wright. *John Hopkinson Premium*, Messrs. A. L. Williams, Ph.D., and L. E. Thompson. *Kelvin Premium*, Mr. E. Colin Cherry. *Overseas Premium*, Prof. K. Aston, and Mr. M. V. Kesava Rao. *Extra Premiums*, Mr. A. H. M. Arnold, D.Eng.; Mr. G. W. Bowdler; Messrs. G. W. Bowdler, and W. G. Standring; Mr. R. Davis; Mr. H. D. Einhorn, Dr. Ing, and Prof. B. L. Goodlet; Miss Hackett, Ph.D., and Mr. A. M. Thomas; Mr. E. A. Richards; Mr. V. Sia; Messrs. R. C. Woods and A. S. MacDonald.

Installations Section Premiums, Messrs. L. J. Davies, H. R. Ruff and W. J. Scott (Crompton Premium); Mr. R. Grierson. *Meter and Instrument Section Premiums*, Messrs. E. A. Burton, J. S. Forrest, and T. R. Warren (Silvanus Thompson Premium); Mr. D. J. Bolton, M.Sc. (Eng.). *Transmission Section Premiums*, Mr. J. W. Leach (Sebastian de Ferranti Premium); Messrs. W. Casson and F. H. Birch. *Wireless Section Premiums*, Mr. O. S. Puckle (Duddell Premium); Messrs. D. C. Espley, D.Eng., and D. O. Walter (Ambrose Fleming Premium); Messrs. J. E. Thwaites and F. J. M. Laver. The awards for papers read before the Students' Sections will be announced later.

Argentine Imports

Small Decline During 1940

THE annual statement of the foreign trade of Argentina for 1940 has just reached this country from Buenos Aires. From it has been extracted the following table showing the values of the imports of the principal groups of electrical goods in that year, with a note of the chief countries of origin and of increases and decreases compared with 1939.

There was a reduction of about 10 per cent. in the electrical import trade as a whole and it will be seen that the decline spread through nearly every important line. The fall was naturally most marked in the case of goods from Germany, while those from occupied countries also suffered. Canada's share in the import trade of Argentina, though not yet large, showed a noteworthy increase. The values given in the table are those adopted by the Argentine Customs. The rate of exchange for the peso may be taken as about 17 to the £.

	1940 Pesos (000)	Inc. or dec. Pesos (000)
Fan motors—		
Total	236	−104
From Germany	16	—
„ Japan	—	−69
„ United States	120	− 20
„ Italy	35	− 30
„ United Kingdom	54	+ 4
Motors up to ¼ HP—		
Total	278	+ 70
From Germany	1	− 6
„ United States	166	+ 31
„ Italy	3	− 2
„ United Kingdom	106	+ 48
Motors and dynamos, over ¼ HP—		
Total	1,809	−460
From Germany	83	−400
„ United States	404	+115
„ Denmark	36	− 65
„ Italy	132	− 21
„ Holland	16	−170
„ United Kingdom	610	+190
„ Sweden	339	− 64
„ Switzerland	141	− 59
Cable and wire, up to 5 mm., covered with cotton, rubber, etc.—		
Total	1,070	−608
From Germany	2	−142
„ United States	353	+243
„ United Kingdom	627	−125
„ Canada	23	+ 23
Cable and wire, over 5 mm., covered with cotton, rubber, etc.—		
Total	455	− 11
From Belgium	6	−107
„ United States	33	+ 27
„ United Kingdom	408	+245
Cable and wire, up to 5 mm., lead-covered—		
Total	158	−249
From United Kingdom	117	− 88
„ Sweden	30	− 65
Cable and wire, over 5 mm., lead-covered—		
Total	2,073	−871
From Germany	19	− 58
„ Belgium	92	+ 10
„ United Kingdom	1,696	−808
Wire, electrical, enamelled—		
Total	367	+ 15
From Germany	5	−153
„ United States	143	+ 61
„ United Kingdom	147	+ 63
Cable and wire, silk-covered—		
Total	31	+ 12
From United States	27	+ 22
„ United Kingdom	4	+ 1
Telephone cables of iron or steel—		
Total	460	+103
From United States	431	+412
Telephone cable, underground—		
Total	3,182	−4,701
From Germany	22	− 565
„ Italy	553	−2,082
„ Belgium	258	−3,334
„ United Kingdom	1,658	+1,268
„ Sweden	137	− 422
„ United States	204	+ 203
Accessories for underground cables—		
Total	36	− 24
From United Kingdom	26	+ 11
Insulating tape—		
Total	106	− 30
From United States	57	− 2
„ United Kingdom	49	− 8
Flex—		
Total	345	−650
From Germany	7	− 14
„ Belgium	8	− 4
„ United States	66	+ 23
„ United Kingdom	220	−278
Radio-telephone apparatus—		
Total	217	−354
From Germany	8	− 71
„ United States	59	− 60
„ Holland	76	−265
„ United Kingdom	73	+ 54
Radio-telephone receivers—		
Total	2,524	−442
From United States	2,008	+185
„ Hungary	233	− 98
„ Holland	264	−489
„ United Kingdom	17	− 31
Radio-telephone amplifiers—		
Total	174	−133
From United States	151	− 21
„ Holland	10	−120
Loudspeakers (metal)—		
Total	441	− 14
From United States	380	+ 78
„ Holland	54	− 90
Radio-telephone parts—		
Total	3,014	+ 74
From Germany	22	−134
„ United Kingdom	148	− 40
„ United States	2,240	+612
„ Holland	496	− 95
Telephones without coils—		
Total	42	+ 5
From Belgium	17	+ 3
„ Sweden	13	− 2
„ Canada	4	+ 4
Telephones with coils—		
Total	437	−314
From Sweden	41	− 44
„ United Kingdom	10	+ 9
„ Germany	17	—
„ Belgium	366	−282

(*Continued on next page*)

Argentine Imports (*Concluded from previous page*)	1940 Pesos (000)	Inc. or dec. Pesos (000)
Telephone magneto—		
Total	81	− 17
From Belgium	62	− 16
„ United Kingdom	9	+ 1
Telephone material—		
Total	466	− 9
From Belgium	145	− 29
„ United States	133	+ 24
„ United Kingdom	155	− 12
„ Canada	13	+ 12
Telegraph material—		
Total	87	+ 20
From United States	18	+ 15
„ United Kingdom	69	+ 14
Accumulator and battery parts—		
Total	1,380	+100
From Germany	2	−244
„ United States	974	+177
„ Japan	10	—
„ United Kingdom	132	+ 47
„ Canada	225	+184
„ Belgium	3	− 41
Batteries—		
Total	138	−230
From United States	57	− 94
„ United Kingdom	74	− 85
„ Denmark	6	− 51
Accumulators, complete, for automobiles—		
Total	55	− 65
From United States	38	− 24
„ United Kingdom	2	+ 1
Ammeters and voltmeters—		
Total	72	− 26
From Germany	1	− 26
„ United States	50	+ 6
„ United Kingdom	13	− 1
Glass bulbs for lamp and valve manufacture—		
Total	457	*
From United States	146	*
„ Holland	170	*
„ Brazil	73	*
Electric bells—		
Total	73	− 9
From Germany	2	− 8
„ Belgium	4	− 7
„ Italy	55	− 1
„ United Kingdom	5	+ 3
House-service meters—		
Total	2,225	−671
From Germany	130	−1,118
„ Denmark	11	−122
„ United States	69	+ 18
„ United Kingdom	55	−424
„ Switzerland	909	+207
„ Sweden	76	+ 9
„ Canada	371	+306
Electric incandescent lamps—		
Total	1,544	+429
From Belgium	278	−104
„ United States	35	+ 19
„ Japan	162	+ 48
„ Holland	411	+238
„ United Kingdom	288	+112
Switches, circuit-breakers, cut-outs, fuses, etc.—		
Total	788	−156
From Germany	22	−552
„ United States	334	+206
„ United Kingdom	77	+ 21
„ Italy	140	+ 73
„ Belgium	141	+ 48
Distribution boards—		
Total	72	−223
From United States	20	− 33
„ United Kingdom	37	− 34
Change-over switches—		
Total	897	−106
From United States	7	+ 5
„ United Kingdom	731	+ 18
Heaters, toasters, kettles, etc.—		
Total	62	− 63
From Germany	4	− 84
„ United States	15	+ 12
„ United Kingdom	33	+ 7
Electric torches—		
Total	327	−156
From United States	55	+ 18
„ Japan	30	+ 5
„ Hong-Kong	217	−183
Electric irons—		
Total	88	+ 15
From Germany	3	− 31
„ United Kingdom	78	+ 63
Vacuum cleaners—		
Total	181	+ 42
From United Kingdom	66	+ 46
„ Sweden	113	+113
Insulating tubes—		
Total	27	−493
From United States	13	− 30
„ United Kingdom	12	−194
Electrical materials, unspecified—		
Total	3,012	+ 38
From Germany	113	−816
„ United States	1,473	+809
„ France	142	+ 60
„ Italy	44	+ 14
„ United Kingdom	673	+405
„ Sweden	17	− 20
„ Switzerland	104	− 57
„ Canada	6	− 6
„ Belgium	66	−360

* Comparative figures not available.

Manufacture in Sweden

FROM the complete report of the A.S.E.A. company (Allmänna Svenska Elektriska Aktiebolaget) it appears that employment during 1941 was good, except in the departments supplying the building industry, although here also there has of late been some recovery. Demand from the home market for material and machinery for hydro-electric power stations, railways and industrial plant has been considerable.

A large new foundry at Västeräs, the headquarters of the combine, has been almost completed, while the principal laboratory has been considerably enlarged to allow of a further extension of the company's research work. Further new buildings are planned, and a million kronor, according to the board's proposals, will be reserved for such purposes. In all 20,464 persons were employed at the different offices and plants of the company and its subsidiaries in Sweden at the end of 1941, against 18,936 a year before.

The affiliated companies abroad have also on the whole been well employed. As regards Electro-Invest it is stated that none of its numerous power stations in different parts of eastern Europe was damaged during the war, operations going on without disturbance anywhere. Among the subsidiaries the following may be mentioned, with net profits for 1940 and 1941, respectively:—Luth & Rosens Elektriska AB. (135,000 kr.; 107,000 kr.); Liljeholmens Kabelfabrik (160,000 kr.; 118,000 kr.); Svenska Turbinfabriks AB. Ljungström (193,000 kr.; 175,000 kr.); AB. Skandinaviska Electricitetsverk (358,000 kr.; 351,000 kr.); AB. Electro-Invest (net profit 3,000 kr.; deficit 84,000 kr.); and A/S Per Kure, Norsk Motor-og Dynamofabrik (229,000 kr.; 188,000 kr.).—*Reuter's Trade Service.*

ELECTRICITY SUPPLY

Consumption and M.D. Charges. Showroom Policy.

Bangor.—RATIONING AND BULK SUPPLY TERMS.—At a meeting of the Town Council last week support was given to a resolution which the borough electrical engineer (Mr. F. O. Harber) had proposed at the I.M.E.A. North West England and North Wales Centre on March 31st. The resolution points to the probability of a reduced unit consumption as a result of rationing not being accompanied by a corresponding reduction in maximum demand. In view of the considerable difference in bulk supply terms to some members of the Centre as compared with the majority of undertakings taking a supply on C.E.B. terms, it is suggested that the Government, when considering the rationing of electricity, should take the necessary steps to ensure that no members of the Centre should be penalised to a greater extent, by arranging for such undertaking to receive its bulk supply on C.E.B. terms during the present emergency. Other Councils in the area are being asked to take similar action.

Bolton.—SHOP LIGHTING.—The Chamber of Trade has suggested to the Electricity Committee that if necessary the shop-window lighting tariff should be temporarily withdrawn as the special rate of charge probably encouraged waste. Concern had been expressed at the extravagant use of electricity for day-time shop-window lighting in a number of premises.

Huddersfield.—TRANSFORMER AND SWITCHGEAR.—The Electricity Department is to purchase a 1,850-kVA transformer and switchgear to replace defective units and provide for certain overloaded equipment.

SUBSTATION.—Sanction has been received to borrow £3,500 for substations and equipment.

London. — WANDSWORTH. — The Borough Council has approved proposals submitted by the County of London Electric Supply Co., Ltd., for laying underground cables.

SOUTHWARK.—The Borough Council Electricity Committee is to provide an AC supply at a cost of £2,160.

Middlesbrough. — EXTENSIONS. — The Town Council has received sanction to borrow £1,290 in connection with extensions to the electricity mains.

Penrith.—RURAL POWER TARIFFS.—The cost of electricity used for power on farms was referred to at a recent meeting of the Rural District Council. Mr. N. Hodgson pointed out that owing to the shortage of labour farmers were turning to electrical equipment, and he had informed those who had asked him about the cost that it would be 2d. a unit. He was therefore much surprised to learn that there were cases in which 2½d., 3d. and 3½d. was being charged. He was on the Council when they permitted the company to have the sole selling rights in the area, and he understood it was restricted to 7d. for lighting and 2d. for power. How, therefore, were the extra prices justified ? They were higher than farmers could afford. Mr. R. Sowerby said he was charged 2d. on one farm and 3½d. on another. The clerk stated that farmers in Westmorland were more generously treated than in the Council's area. Miss Dickinson remarked that a farmer proposed to install an electric milker to save labour but at 3½d. a unit it was prohibitive. The matter was referred to the General Purposes Committee.

Preston. — MINIMUM CHARGES. — The Electricity Committee has decided not to take any definite steps in regard to minimum consumption charges until the Government arrives at a conclusion on fuel rationing. In the meantime the subject is being carefully examined.

Southport.—ECONOMISERS.—The Electricity Committee is to replace economisers at the power station at a cost of £2,200.

Stalybridge.—CLOSING OF SHOWROOMS TO BE CONSIDERED.—The Stalybridge, Hyde, Mossley and Dukinfield Joint Transport and Electricity Board has been asked to state the cost of maintaining electricity showrooms throughout the Board's area, and whether, in view of restrictions on electrical development during the war, the showrooms could be closed down as a matter of economy.

St. Helens.—POLICY REGARDING MINIMUM CHARGES.—A request that minimum charges for electricity should be abolished during wartime was made at a recent meeting of the Town Council. Ald. J. Hewitt, chairman of the Electricity Committee, said they had on several occasions waived minimum charges in cases of hardship. To cover overhead charges, including the collection of money from meters, it cost the Electricity Department at least 18s. 6d. per annum in respect of each connection.

RADIO & TELEPHONY

Dutch Guiana.—RADIO-TELEPHONE SERVICE.—A new radio-telephone service between Paramaribo and States of North and Central America and the Hawaii Islands was inaugurated on May 2nd. The first conversation was between Dr. J. C. Kielstra, Governor of Dutch Guiana, and Dr. Loudon, Netherlands Minister in the United States.—*Reuter.*

West Indies.—NEW TRANSMITTER.—A new radio station called "Princess Juliana Sender" has begun transmitting at Curacao.—*Reuter.*

TRANSPORT

Liverpool.—TRAMWAY EXTENSIONS.—The Corporation Passenger Transport Department has recommended the City Council to apply for sanction to borrow money for tramway extensions. Application is also being made for a loan for other new tramways.

United States. — TRANSPORT FOR WAR WORKERS.—The Milwaukee Electric Railway & Transport Co. recently took delivery of the first of 50 new trolley-coaches purchased at an aggregate cost of $625,000. *Mass Transportation* states that this is part of the provision which the company is making on behalf of the national war effort to make available ample transport facilities for workers.

Bucket Excavators

Electrical Driving Systems

SOME idea of the increasing use of electro-mechanical excavators of the single-bucket type, both power shovel and drag-line varieties, is afforded by the paper contributed by Mr. P. H. R. Durand (Ruston-Bucyrus, Ltd.) to the Installations Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on May 14th.

After describing the sphere of application of such machines and commenting upon the increasing importance of driving them electrically, the author explains their fundamental motions and structural limitations. A summary of special service conditions precedes discussion of driving methods for the two main groups of excavators, respectively incorporating friction clutches and individual motors. Ward-Leonard control with three-coil dynamo and separately excited motor is referred to in detail.

Main and auxiliary equipment is dealt with from both electrical and mechanical aspects; installation and wiring details are supplemented by typical lay-out and wiring diagrams. Attention is directed to certain special aspects of power distribution to excavation projects, representative power consumption details being included. In four years the electrically equipped excavators sold by one manufacturer alone increased from eight with a total nominal horse-power of 500 to 76 machines totalling 5,710 HP.

Machine Design and Control

The fundamental drive for multi-motor excavators, the larger of which require several hundred horse-power of motors, has for some years been stabilised, although Ward-Leonard control does not necessarily represent finality. There is still considerable scope for intensive detailed improvement. Thus research into transient load conditions may afford data for the more effective correlation of generator and motor design with the control scheme and the application of special systems of excitation. Progress may be sought in the direction of controlling margins in motor performances due to winding resistance variation arising from temperature changes in the exciter-generator-motor system. The development of special AC motors with appropriate control gear would avoid the necessity for converting plant with its constant power losses and large floor space requirements.

The utilisation of Diesel-electric generating sets on excavators, when public supplies of electricity are not available, has been retarded somewhat by the cost and dimensions of directly coupled sets on account of the comparatively low engine and generator speeds and limited space available on excavator decks, though high-speed mobile sets connected to excavators by trailing cables possess possibilities. But fundamental changes, or innovations, must not compromise such essential qualities as robustness and reliability.

Measuring Crest Voltage

Capacitor-Galvanometer Method

HOW a ballistic galvanometer in conjunction with simple auxiliary apparatus may be used for accurately measuring the crest value and time of duration of transient voltage applied in impulse tests is described in a paper by Mr. G. W. Bowdler (National Physical Laboratory) submitted to the Meter and Instrument Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on May 8th.

The voltage, or a fraction of it, is applied through a rectifier to a capacitor C that is thereby charged to a crest voltage v, before discharging through the galvanometer (which determines a quantity of electricity Q), thus permitting $v = Q/C$ to be calculated. The time-lag chronometer applies a convenient fraction of the voltage to the grid of a triode valve that is normally biased until anode current ceases to flow at anode voltage V. The amplitude of the voltage applied to the grid is sufficiently great to enable the anode current to reach its limiting value of approximately V/R (where R is the anode resistance) for the major part (t) of the duration of the impulse. The anode current flows through the galvanometer, recording $Q = (V/R)\,t$.

Comparison of Results

Both methods have been compared with results obtained simultaneously by a high-speed cathode-ray oscillograph, which is accurate within 1 per cent. Crest voltage agreement is within 2 per cent., even with voltage duration of the order of 10^{-7} second, while time-lag agreement is within 0·2 micro-second when the grid bias of the valve is suitably adjusted.

The measurements are not critically dependent upon the characteristics of the thermionic valves in the circuit, and the range of measurement can easily be extended by using suitable high-voltage resistors. The two circuits have been conveniently assembled in combination to form general impulse-measuring equipment with mains-operated valves.

As examples of its uses, the time-lag curve of a 10-in. rod gap (obtained in a small fraction of the time necessary to do so oscillographically) is reproduced in the paper, which concludes with a few measurements of the length of the front and tail of an impulse wave.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The British Electric Traction Co., Ltd., reports a revenue for the year ended March 31st last of £767,588 (against £748,552) and a profit, after meeting expenses, debenture interest and taxation, of £105,750 (against £81,661). The following final dividends are proposed:—Participating preference stock 5 per cent. (again making 8 per cent.); 4 per cent. on the preferred ordinary stock (making 8 per cent.); and 30 per cent. on the deferred ordinary stock (making 45 per cent.). £8,434 is transferred to undivided profits account.

Hopkinsons, Ltd., report a trading profit for the year ended January 31st of £318,132, as compared with £268,411 in the preceding year, to which is added investment and other income of £6,152, making £324,284. The net profit, after providing for depreciation and directors' and auditors' fees, is £294,011 (against £240,600). Tax provision is £238,795. As already announced, the ordinary dividend for the year is maintained at 15 per cent. The balance carried forward is £73,260 (against £56,544 brought in).

Sangamo Weston, Ltd., reports a trading profit for 1941 of £160,229, as compared with £70,112 for the previous year. After deducting depreciation, A.R.P., tax, etc., a balance of £51,307 is available. A sum of £30,000 is placed to war contingency reserve, and a dividend of 15 per cent. (against 10 per cent.) is paid for the year. The balance carried forward is £94,408 (against £88,339 brought in, less an additional £3,426 for income tax).

The Marconi International Marine Communication Co., Ltd., states that the net profit for last year was £96,406 (as compared with £96,525 in 1940) after providing £40,000 for taxation and a similar amount as reserve against assets in enemy countries. The final dividend of 5 per cent. maintains the year's distribution at 7½ per cent. and £25,410 (against £18,458) is carried forward.

Babcock & Wilcox, Ltd., in a preliminary statement, announce a profit for 1941 of £616,021, as compared with £717,347 for 1940. It is proposed to pay a final dividend of 6 per cent., and a bonus of 1 per cent., maintaining the distribution for the year at 11 per cent.

The Power Investment Corporation, Ltd., reports a profit for 1941–42 of £21,662 (against £23,555). The dividend on the 5 per cent. cumulative preference stock is paid, but the ordinary stock again receives no dividend.

Ransomes & Rapier, Ltd., are paying a final dividend of 3 per cent., making 5 per cent. free of tax, against 6 per cent. free of tax for 1940. The net profit, after meeting taxation, rose from £17,592 to £19,938.

The Anglo-American Telegraph Co., Ltd., reports that dividends on the three classes of stock paid during the year ended March 31st amounted to £135,187 (£154,863), which, with the addition of £127,313 for income tax, totalled £262,500, equal to the annual rental receivable from the Western Union Telegraph Co. under the lease. The credit balance on revenue account of £65,625 (same) was available for payment of dividends and income tax for the quarter to March 31st, 1942.

The Hankow Light & Power Co., Ltd., in its report for the year ended March 31st, states that it has only been possible to incorporate trading results for the six months ended September 30th last, after which date no returns had been received from Hankow. A loss of £1,033 is recorded and £137 (£1,170) is carried forward.

Ever-Ready (Ireland), Ltd., is paying a first and final dividend of 10 per cent. Income tax requires £4,052, reserve receives £3,000, and tax reserve £1,000. The balance carried forward is £1,502.

The West London & Provincial Electrical & General Trust, Ltd., announces a final dividend of 3½ per cent., maintaining the year's distribution at 5½ per cent.

Tube Investments, Ltd., has declared an interim ordinary dividend of 10 per cent., less tax (same), and at the same rate relatively on the liaison ordinary shares.

Ransomes, Sims & Jefferies, Ltd.—From a net profit of £77,401 (against £85,142) the company is again paying an ordinary dividend of 7½ per cent.

The British Thermostat Co., Ltd., has announced a final dividend of 11 per cent., maintaining the distribution for the year at 18½ per cent.

Richard Johnson & Nephew, Ltd., are paying a first and final ordinary dividend of 9 per cent. (unchanged).

The Associated Equipment Co., Ltd., has declared an interim dividend of 6d. per £1 unit, free of tax (same).

The West Gloucestershire Power Co. has declared a first and final ordinary dividend of 3½ per cent. (against 4½ per cent.).

New Companies

Brooks & Bohm (Dry Batteries), Ltd.—Private company. Registered April 18th. Capital, £3,500. Objects: To acquire the business of dry battery manufacturer carried on by Z. Bohm at 90, Victoria Street, S.W.1 and 25, London Road, S.E.23, and to carry on the business of manufacturers of and dealers in electric accumulators and batteries, wireless sets, gramophones, etc. Directors: Z. Bohm, 23, Bourne Avenue, Southgate, N.14 (permanent chairman and managing director), and three others. Registered office: 90, Victoria Street, S.W.1.

Eden Machine Tool Co., Ltd. — Private company. Registered April 16th. Capital, £10,000. Objects: To acquire from F. E. Rowland a business of manufacturing electrical engineer and tool maker lately carried on by Desmond G. Lewin. Directors: F. E. Rowland,

West Heath, Leicester Road, Hale, Ches., and Kenneth L. Watson, "Easedale," Arthog Road, Hale. Solicitors: Cobbett Wheeler & Cobbett, Manchester 12.

Smiths Radio, Ltd. — Private company. Registered April 15th. Capital, £1,000. Objects: To acquire the business of a radio dealer and furnisher carried on by E. J. Smith at Brighton, and to carry on the business of manufacturers of, and dealers in, electrical apparatus, wireless and television sets, components and accessories, gramophones, radio-gramophones, etc. E. J. Smith, 79, Mill Road, Burgess Hill, Sussex, is the first director. Secretary: Miss L. I. Lower. Registered office: 24, Gloucester Place, Brighton.

C. L. P. Battery Carbons, Ltd.—Private company. Registered May 1st. Capital, £100. Objects: To carry on the business of manufacturers, reclaimers and processors of and dealers in carbons for electric batteries, chemical manufacturers and dealers, electrical and mechanical engineers, etc. Directors: C. L. Parker, "Limehurst," Paddockhall Road, Haywards Heath, Sussex, and R. White, 31, Sunte Close, Haywards Heath. Registered office: "Limehurst," Paddockhall Road, Haywards Heath, Sussex.

Companies Struck Off the Register

The names of the following companies have been struck off the Register and they are thereby dissolved:—Brooklyn Electrical Development Co., Ltd.; Electronic Rangefinders, Ltd.; Great West Radio Service, Ltd.; Radiometrics (Nottingham), Ltd.

Companies' Returns

Statements of Capital

Nalder Bros. & Thompson, Ltd.—Capital, £40,000 in £1 shares (15,000 preferred and 25,000 ordinary). Return dated December 31st. 15,000 preferred and 24,500 ordinary shares taken up. £14,064 paid. £25,436 considered as paid. Mortgages and charges: Nil.

Flather & Co., Ltd.—Capital, £20,000 in 20,000 shares of £1 each. Return dated January 12th, 1942. 13,208 shares taken up. £11,708 paid. £1,500 considered as paid. Mortgages and charges: Nil.

Donovan Electrical Co., Ltd.—Capital, £50,000 in £1 shares. Return dated December 29th. 29,100 shares taken up. £29,100 considered as paid. Mortgages and charges: Nil.

Lamp Manufacturing & Railway Supplies, Ltd.—Capital, £9,000 in 5,500 preference and 3,500 ordinary shares of £1 each. Return dated February 6th. 4,500 preference and 3,003 ordinary shares taken up. £4,503 paid. £3,000 considered as paid. Mortgages and charges: Nil.

Lane & Ryder, Ltd.—Capital, £1,000 in 1,000 ordinary shares of £1 each. Return dated December 30th. All shares taken up. £100 paid. £900 considered as paid. Mortgages and charges: Nil.

E. W. Jones (Electrical), Ltd.—Capital, £1,000 in 1,000 shares of £1 each. Return dated December 31st, 1941 (filed February 13th, 1942). 903 shares taken up. £903 paid. Mortgages and charges: Nil.

T. G. Brunskill, Ltd.—Capital, £1,000 in £1 shares. Return dated February 12th. 701 shares taken up. £701 paid. Mortgages and charges: £250.

Atozed (London), Ltd.—Capital, £5,000 in £1 shares. Return dated July 1st, 1941 (filed February 19th, 1942). 1,031 shares taken up. £1,031 paid. Mortgages and charges: Nil.

Mortgages and Charges

Fusarc Welding Co., Ltd.—Mortgage and charge on the company's undertaking and other property, present and future, including uncalled capital, dated April 22nd, 1942, to secure all moneys due or to become due from the company to Midland Bank, Ltd.

Satisfaction in full on April 22nd, 1942, of mortgage dated March 25th, 1939, and registered April 5th, 1939, securing £2,400.

H. H. Linton & Co., Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated April 13th, 1942, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Underwood (Electric), Ltd.—Assignment on April 15th, 1942, of proceeds of certain contracts, to secure all moneys due or to become due from the company to Martins Bank, Ltd., not exceeding £500.

Kelvin-Norton Electric Co., Ltd.—Charge on certain contract moneys, dated April 24th, 1942, to secure all moneys due or to become due from the company to Midland Bank, Ltd.

Receiver Released

Locke & Soares, Ltd. (Old Co.).—J. C. Gardner, 24, Coleman Street, E.C., who was appointed receiver on March 21st, 1940, now states that the debentures under which he was appointed were held to be irregular and therefore his appointment as receiver was invalid.

Winding-up Petition Dismissed

In the Companies Court, Chancery Division, recently Mr. Justice Uthwatt had before him a contributors' petition for the compulsory winding up of the Victor Battery Co., Ltd. Mr. Wynn Parry, K.C., for the petitioners, said that the parties had arrived at terms of settlement, and by consent the petition would be dismissed, with no order as to costs. His Lordship agreed.

Liquidation

Whitehead Switchgear & Inventions, Ltd., Western Mail Chambers, St. Mary Street, Cardiff.—Liquidator, Mr. L. S. Findlay, 35, Windsor Place, Cardiff, appointed April 27th, with a committee of inspection.

Bankruptcy

Maddock Bros. (a firm), electrical engineers, 7, The Temple, Dale Street, Liverpool.—First meeting to-day, May 15th, at the Official Receiver's Office, Hunter Street (Friends Meeting House), Liverpool. Public examination, June 23rd, at the Court House, Hunter Street (Friends Meeting House), Liverpool.

STOCKS AND SHARES

TUESDAY EVENING

STOCK EXCHANGE markets are moving on quiet lines. The Chancellor of the Exchequer disappointed a good many people when he announced that the concessions he was able to make in his latest Budget proposals were comparatively trifling. Hopes had been entertained that companies whose assets are of wasting character would be given an extra concession in regard to E.P.T. and that this relief might also be applied to companies which had begun to attain, after years of hard work, a profit-earning position. Sir Kingsley Wood has, however, hardened his heart against pleas on behalf of such undertakings. It cannot be said that prices in the Stock Exchange markets suffered any particular decline. In fact the industrial market is as firm as ever. Cable and Wireless stocks stand out with prominent strength. Speculative buying of Brazilian and other South American issues continues in evidence.

Stock Exchange Man Power

The Government has announced that it is taking into consideration the question of continuing the Stock Exchanges, having regard to the need for man-power. Mr. Bevin, the Minister of Labour, states that the matter is receiving the active attention of himself and the Chancellor of the Exchequer. The question arose through an inquiry from Mr. Ellis Smith, who asked in the House of Commons whether it was necessary to continue the maintenance of Stock Exchanges, in view of the large number of men therein employed.

Members of the Stock Exchange are by no means perturbed. They are far more interested in the discussions on fuel rationing, and its possible effect upon profit-earning by industrial companies. No electrical shares have suffered.

Argentine Affairs

Anglo-Argentine Tramways issues—shares and debenture stocks—have again come into notice by reason of a scheme, said to have been approved by the Argentine Government, that will have the effect of doing away with the years-old competition between the Buenos Aires Transport Corporation and the Anglo-Argentine Tramways Co. If at the end of a year, the proposed scheme is not working satisfactorily, it was suggested that the Argentine Government should take over the loan at par. On the strength of anticipations that the scheme will duly materialise, Anglo-Argentine Tramway debenture stocks are advancing in price. The income stock is up to 10. The preference shares—gambling counters as they are—are so far little affected. The City of Buenos Aires Tramways Co., Ltd., is entitled to the first preferential charge on the net receipts of its own system and that of the Anglo-Argentine Tramways; the company's £5 shares have risen from their recent-lowest of 30s. to 40s.

Gilt-Edged Electrics

A fairly large block of English Electric 6½ per cent. preference has been on offer at 33s. 9d., March and September dividends. The yield is a meagre £3 17s. per cent., but the dividend service is exceptionally well covered, and the shares are regarded as being well-nigh gilt-edged. A yield of a little over 4 per cent. is offered by Lancashire United Transport 5½ per cent. preference, which can be bought at 27s. 3d. The dividend service requires an annual £16,500; in last year's accounts, there was £84,000 available to meet it.

Preference shares in the Electricity Supply list are mostly quoted upon a basis at which the return comes to under 4 per cent. on the money. The 6 per cent. preference shares of the County of London, Midland Counties and Scottish Power, for instance, stand at 33s., and give an income of no more than £3 12s. 9d. per cent. A still smaller yield is shown by South Metropolitan Electric 4 per cent. third preference, of which 10,000 are on offer in the market at 22s. 3d. These return £3 11s. 9d. per cent. The last-published report showed the earnings to be sufficient to cover the dividend on this issue nearly twelve times over.

Cable and Wireless

Cable and Wireless stocks have fresh advances to their credit. The ordinary is 3½ up at 57½, and the preference has risen 2 to 96½. The dividend on the ordinary stock is due for announcement in a month's time, and it seems to be taken for granted that 4 per cent. for the year—the same as that distributed twelve months previously—will be declared. The recent fall to 47 came about, it may be recalled, as a result of apprehensions aroused by the Japanese invasion of the Pacific. It is unfortunately the case that a good deal of irresponsible talk was current at that time in regard to the likelihood of Cable and Wireless traffic suffering severely from the war developments in the Far East. Saner counsels prevailed when the bout of selling on behalf of timid stockholders came to an end. The combine, in spite of its huge capital, has unique scope for business, and after the war its earnings are likely to go ahead by leaps and bounds.

Price Fluctuations

Anglo-Portuguese Telephones have come into demand and at 15s. show a gain of 2s. 6d. Great Northern Telegraphs recovered the

(*Continued on page* 641)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend 1939–40	Dividend 1940–41	Middle Price May 12	Rise or Fall	Yield £ s. d.
Home Electricity Companies					
Bournemouth and Poole	15	12½	55/–	..	4 11 0
British Power and Light	6	6	28/6	..	4 4 3
City of London	7	7	27/6	..	5 1 9
Clyde Valley	8	8	40/–	..	4 0 0
County of London	8	8	37/6	..	4 5 6
Edmundson's:					
7% Pref.	7	7	35/–	..	4 0 0
Ord.	6	6	28/6	..	4 4 3
Elec. Dis. Yorkshire	9	9	42/–	..	4 5 9
Elec. Fin. and Securities	12½	12½	47/6	..	5 5 2
Elec. Supply Corporation	10	10	45/–	..	4 9 0
Isle of Thanet	2	Nil	11/3	..	—
Lancs. Light and Power	7½	7½	35/–	..	4 5 9
Llanelly Elec.	5½	5½	22/–	..	5 0 0
Lond. Assoc. Electric	4½	4	18/3	..	4 7 8
London Electric	6	6	25/–	..	4 16 0
London Power Red. Deb.	5	5	104½	..	4 15 7
Metropolitan E.S.	8	8	36/3	..	4 8 6
Midland Counties	8	8	39/6	..	4 1 0
Mid. Elec. Power	9	9	42/–	..	4 5 9
Newcastle Elec.	7	7	27/6	..	5 1 10
North Eastern Elec. Ordinary	7	7	31/3	..	4 9 7
7% Pref.	7	7	34/6	..	4 1 2
Northampton	10	10	46/3	..	4 6 7
Notting Hill 6% Pref. (£10)	6	6	9	+½	—
Northmet Power:					
Ordinary	7	7	35/9	..	3 18 4
6% Pref.	6	6	32/6	..	3 13 10
Richmond Elec.	6	6	25/–	..	4 16 0
Scottish Power	8	8	39/6	..	4 1 0
Southern Areas	5	5	21/3	..	4 14 0
South London	7	7	26/–	..	5 7 8
West Devon	5	5	22/–	..	4 11 0
West Glos.	4½	3½	20/–	–½	3 10 0
Yorkshire Elec.	8	8	40/–	..	4 0 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	4/–	..	—
Calcutta Elec.	8*	7*	20/–	–9d.	—
Cawnpore Elec.	10	10	25/–	..	8 0 0
East African Power	7	7	27/–	..	5 3 8
Jerusalem Elec.	7	5	18/9	..	5 6 8
Kalgoorlie (10/–)	7½	7½	7/6	–2/–	10 0 0
Madras Elec.	6*	4*	15/–	..	5 6 8
Montreal Power	1½	1½	23	–1	6 5 0
Palestine Elec. "A"	Nil	Nil	18/9	..	—
Perak Hydro-elec.	6	7	5/–	..	—
Shawinigan Power	83cts.	90cts.	14½	..	—
Tokyo Elec. 6%	6	6	12½	..	—
Victoria Falls Power	15	15	72/6	+1/6	4 2 9
Whitehall Inv. Pref.	7½	5	15/9	..	6 7 0

Company	Dividend 1939–40	Dividend 1940–41	Middle Price May 12	Rise or Fall	Yield £ s. d.
Public Boards					
Central Electricity:					
1950–70	5	5	110½	..	4 10 6
1955–75	5	5	115	..	4 7 0
1951–73	4½	4½	109	..	4 2 7
1963–93	3½	3½	103½xd	..	3 7 8
1974–94	3½	3½	99	..	3 5 8
London Elec. Trans. Ltd.	2½	2½	94	..	2 13 2
London & Home Counties 1955–75	4½	4½	112	+2	4 0 4
Lond. Pass. Trans.:					
A	4½	4½	120½	..	3 14 9
B	5	5	118½	..	4 4 5
C	3	2⅞	40½	..	7 2 0
West Midlands J.E.A. 1948–68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo.-Am. Tel.:					
Pref.	6	6	112½	+1	5 6 8
Def.	1½	1½	26	+½	5 15 5
Anglo-Portuguese	8	8	15/–	+½	10 13 4
Cable & Wireless:					
5½ Pref.	5½	5½	96½	+2	5 14 0
Ord.	4	4	57½	+3½	6 19 2
Canadian Marconi $1	Nil	4cts.	5/–	..	3 7 0
Globe Tel. & Tel.:					
Ord.	8½*	8½*	27/6	..	—
Pref.	6	6	27/6	..	4 7 5
Great Northern Tel.: (£10)	20	20	13½	+½	—
Inter. Tel. & Tel.	Nil	Nil	3½	..	—
Marconi-Marine	7½	7½	30/–	..	5 0 0
Oriental Tel. Ord.	11½*	16	45/–	..	7 2 3
Telephone Props.	6	Nil	8/9	..	—
Tele. Rentals (5/–)	10	10	8/9	..	5 14 1
Traction and Transport					
Anglo. Arg. Trans.:					
First Pref. (£5)	Nil	Nil	5/–	..	—
4% Inc.	Nil	Nil	10½	+1	—
Brit. Elec. Traction:					
Def. Ord.	45	45	915	..	4 18 3
Pref. Ord.	8	8	180	..	4 9 0
Bristol Trams	8	10	45/–	..	4 9 0
Brazil Traction	$1	50c.	14½	+⅛	—
Calcutta Trams	8	5½	11/3	..	9 15 6
Cape Elec. Trams.	5	5	19/–	..	5 5 3
Lancs Transport	10	10	45/–	..	4 9 0
Mexican Light:					
1st Bonds	5	5	81½	..	6 2 8
Rio 5% Bonds	5	5	97½	..	5 2 8
Southern Bly.:					
5% Prefd.	5	5	64½	..	7 15 0
5% Pref.	5	5	111½	..	4 9 6
T. Tilling	10	10	50/–	..	4 0 0
Tilling & B.A.	7*	6¼*	55/–	..	2 7 3
West Riding	10	10	39/6	..	5 1 3

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend 1939–40	Dividend 1940–41	Middle Price May 12	Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing					
Aron Elec. Ord. ..	Nil	7½	24/–	..	6 5 0
Assoc. Elec.:					
Ord.	10	10	45/–	..	4 9 0
Pref.	8	8	38/9	..	4 2 4
Automatic Tel.& El.	12½	12½	51/3	+⅛	4 17 6
Babcock & Wilcox	11	11	44/6	..	4 18 9
British Aluminium	10	10	43/3	..	4 12 4
British Insul. Ord.	20	20	93/9	..	4 5 6
British Thermostat (5/–)	18½	18½	14/6	..	6 7 6
British Vac. Cleaner (5/–)	12½	10	11/3	..	4 9 0
Brush Ord. (5/–) ..	Nil	6	5/–	..	6 0 0
Callender's ..	15	15	72/6	..	4 2 9
Chloride Elec.Storage	15	15	75/–	..	4 0 0
Cole, E. K. (5/–) ..	Nil	7	11/–	..	3 3 8
Consolidated Signal	17	17	75/–	..	4 10 8
Crabtree (10/–) ..	17½	17½	29/6	..	5 18 8
Crompton Parkinson Ord. (5/–) ..	30	20	22/6	..	4 9 0
E.M.I. (10/–) ..	Nil	6	14/3	+3d.	4 4 3
Electric Construction	10	10	34/6	..	5 16 0
Enfield Cable Ord.	12½	12½	55/–	..	4 11 0
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	40/–	..	5 0 0
Ensign Lamps (5/–)	25	25	16/3	..	7 13 10
Ericsson Tel. (5/–)..	22*	20*	41/3	..	2 8 6
Ever Ready (5/–) ..	40	40	31/6	..	6 7 0
Falk Stadelmann ..	7	7½	22/–	..	6 16 4
Ferranti Pref. ..	7	7	27/6	..	5 1 10
G.E.C.:					
Pref.	6½	6½	35/–	..	3 14 2
Ord.	20	17½	83/9	..	4 3 9
Greenwood & Batley	15	13	29/6	+9d.	8 16 4
Hall Telephone(10/–)	10	12½	18/9xd.	+1/6	6 13 4
Henley's (5/–) ..	20	20	22/6	..	4 9 1
4½% Pref. ..	4½	4½	22/6	..	4 0 0
Hopkinsons ..	15	15	47/–	..	6 7 10
India-Rubber Pref.	5½	5½	21/3	..	5 3 6
Intl. Combustion ..	32½	30	107/6	..	5 11 6
Johnson & Phillips	15	15	60/–	..	5 0 0
Lancashire Dynamo	20	20	65/–	..	6 3 1
Laurence,Scott (5/–)	15	12½	9/–	..	6 19 0
London Elec. Wire	7½	7½	28/3	..	5 6 2
Lucas, J.	15	15	65/–	..	4 12 4
Mather & Platt ..	10	10	38/9	..	5 3 3
Metropolitan Elec. Cable Pref. ..	5½	5½	21/3	..	5 3 6
Murex	20	20	92/6	..	4 6 9
Pye Deferred (5/–)	25	25	15/–	..	8 6 8
Revo (10/–) ..	5	20	27/6	+⅛	7 5 6
Reyrolle	12½	12½	57/6	..	4 7 0
Siemens Ord. ..	7½	7½	26/3	..	5 14 3
Smith, S. (1/–) ..	50	37½	7/–	..	5 7 2
Strand Elec. (5/–)..	2	4	3/6	..	5 14 4
Switchgear & Cowans (5/–) ..	15	10	10/–	..	5 0 0
T.C.C. (10/–) ..	Nil	5	11/3	..	4 9 0
T.C. & M.	10	10	41/3	..	4 17 0
Telephone Mfg. (5/–)	9	9	9/3	..	4 17 3
Tube Investments	23¾	20	82/6	..	4 17 0
Vactric (5/–) ..	4	Nil	6/–	..	—
Vickers (10/–) ..	10	10	16/9	..	5 19 5
Ward & Goldstone (5/–)	20	20	18/6	..	5 8 3
Westinghouse Brake	10	10	47/6	..	4 4 2
WalsallConduits(4/–)	55	55	33/9	..	6 10 4
West, Allen (5/–) ..	7½	7½	5/9	..	6 10 5

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 639)

10s. lost a week ago. Marconi Marines are unchanged at 30s. on maintenance of the 7½ per cent. dividend. This had been generally expected. Anglo-American Telegraph stocks are again better. In the Electricity Supply group, Notting Hill 6 per cent. preference strengthened to 9, and amongst Overseas shares, Calcutta Electrics, after their recent spurt, reacted to 20s. upon the further advance of the Japanese. Kalgoorlie Electric at 7s. 6d. are a florin down, doubt being entertained as to whether the company can continue its previous rate of dividend.

The Victoria Falls and Transvaal Power Company's shares recovered to 72s. 6d. upon removal of the threat to Madagascar. Amongst gilt-edged stocks, a rise of 2 points lifted London & Home Counties 4½ per cent. to 112, though West Midlands Joint Electricity Authority 5 per cent., which usually move in company with the former stock, are left unchanged at 110.

Hall Telephones rose to 18s. 9d. on the excellent figures provided by the accounts, and Automatic Telephones are also ⅛ better at 51s. 3d. Revo 10s. shares have gained ⅝ at 27s. 6d., the high yield attracting purchasers. West Gloucestershire Power fell 2s. 6d. to 20s. on reduction of the dividend from 4½ to 3½ per cent. Babcock & Wilcox continue the 11 per cent. paid in each of the past two years. The company's profits show a falling off of £101,000. Greenwood & Batley are 9d. higher at 29s. 6d.

Brush Electrical

The Brush Electrical Co. has given notice of a meeting to be held on June 2nd next, for the purpose of passing resolutions that will increase the capital of the company to £1,500,000 by the creation of 500,000 shares of £1 each of no specified class. A second resolution proposes that, upon any of these half-million shares so created being issued, such shares shall, upon becoming fully paid, be converted into stock. Particulars were given in last week's ELECTRICAL REVIEW (page 605) of the company's intention to redeem its 5½ per cent. and 4½ per cent. debenture stocks. Holders of the 4½ per cent. debenture stocks are given the option of exchanging into the company's 5½ per cent. preference shares, or of taking 102 per cent. in cash.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specification will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *can be obtained from the Patent Office*, 25, *Southampton Buildings, London, W.C.*2.

1939

16714. "Receivers for television." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. June 8th, 1938. (544542.)

1940

11405. "Oscillatory circuits for very high frequencies." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). July 8th, 1940. (Convention date not granted.) (544475.)

14249. "Treating of articles by the heating action of high-frequency electric fields." British United Shoe Machinery Co., Ltd. (United Shoe Machinery Corporation). September 16th, 1940. (544583.)

15041. "Preparation of fluorescent materials." British Thomson-Houston Co., Ltd. October 28th, 1939. (544444.)

15050. "Electricity conductor units." L. G. Morten. October 9th, 1940. (Convention date not granted.) (544488.)

15143. "Casting of vitreous material." British Thomson-Houston Co., Ltd. October 13th, 1939. (Addition to 508295.) (544512.)

15168. "Thermionic valve circuits." Standard Telephones & Cables, Ltd., and B. B. Jacobsen. October 11th, 1940. (544447.)

15169. "Telegraph repeaters." Standard Telephones & Cables, Ltd., and L. B. Haigh. October 11th, 1940. (544448.)

15312. "Valve mechanism for unloading a compressor." Wagner Electric Corporation. October 25th, 1939. (544554.)

15313. "Suction cleaners." Hoover, Ltd. October 19th, 1939. (544555.)

15399. "Coil holders." W. Pinfold and Gerrard Industries, Ltd. October 17th, 1940. (544591.)

15714. "Distance determination by wave reflection." Marconi's Wireless Telegraph Co., Ltd. October 25th, 1939. (544452.)

15909. "Coin-freed prepayment meters." F. S. Ash, A. Bates and Metropolitan-Vickers Electrical Co., Ltd. October 31st, 1940. (Addition to 531825.) (544557.)

16017. "Electric switch bases or the like." J. H. Tucker & Co., Ltd., and F. C. Fuke. November 2nd, 1940. (544594.)

16074. "Electric distribution arrangements." British Insulated Cables, Ltd., and O. W. Minshull. November 4th, 1940. (544515.)

16344. "Electrical heating apparatus." A. A. Cohen and F. G. Hancock. November 11th, 1940. (544516.)

16518. "Magnetic thickness gauges." British Thomson-Houston Co., Ltd. November 16th, 1939. (544498.)

16806. "Directive antennæ." Marconi's Wireless Telegraph Co., Ltd. November 22nd, 1939. (544499.)

17160. "Microphones." Marconi's Wireless Telegraph Co., Ltd. November 30th, 1939. (544596.)

17353. "Switches for electric torches or the like." Phillips Telescopic Taps, Ltd., and T. Bradbury. December 6th, 1940. (544517.)

17843. "Mounting devices for electric lamps." British Thomson-Houston Co., Ltd. December 18th, 1939. (Cognate application, 17844/40.) (544562.)

17867. "Connector unit for electric wiring system." J. F. O'Brien. December 19th, 1940. (544454.)

18063. "Automatic frequency control in frequency or phase modulated wireless transmission." Marconi's Wireless Telegraph Co., Ltd. December 22nd, 1939. (544502.)

1941

208. "Method and apparatus for the lapping of piston rings." J. S. Turnbull and Metropolitan-Vickers Electrical Co., Ltd. January 6th, 1941. (544503.)

279. "Diesel-electric vehicles." Crompton Parkinson, Ltd., and H. G. McClean. January 8th, 1941. (544504.)

505. "Automatic temperature - control systems." F. W. Jones and Metropolitan-Vickers Electrical Co., Ltd. January 14th, 1941. (Addition to 479611.) (544457.)

586. "Portable or transportable pump units and safety guards therefor." Sigmund Pumps (Great Britain), Ltd., and M. Sigmund. January 15th, 1941. (544459.)

874. "X-ray apparatus." Philips Lamps, Ltd., and W. R. Gray. January 22nd, 1941. (544564.)

1010. "Electric clocks." A. W. Haydon. January 25th, 1940. (544521.)

1117. "Overload relays." Westinghouse Electric International Co. January 24th, 1940. (544464.)

1134. "Joints for covered electrodes for use with continuous welding machines, and their manufacture." Dunlop Rubber Co., Ltd., G. E. Sharp and G. H. Whale. January 28th, 1941. (544566.)

1539. "Light valves." Electrical Research Products, Inc. February 14th, 1940. (544600.)

2134. "Systems for the electrical transmission of sounds." Electrical Research Products, Inc. April 5th, 1940. (544569.)

2860. "Door latches." British Thomson-Houston Co., Ltd. March 1st, 1940. (544528.)

3476. "Insulation of windings of dynamo-electric machines." British Thomson-Houston Co., Ltd. March 15th, 1940. (544470.)

3500. "Temperature control apparatus for mechanical refrigerators." G. R. Shepherd (Westinghouse Electric International Co.). March 14th, 1941. (544530.)

3540. "Electric register control systems." British Thomson-Houston Co., Ltd. March 14th, 1940. (544601.)

5165. "Calculating device for ascertaining the optimum waveband in short-wave wireless communication." N. A. M. McKie. April 22nd, 1941. (544533.)

5777. "Electro-deposition of palladium." Mond Nickel Co., Ltd. May 20th, 1940 (544534.)
6501. "Fault protection systems for electric switchgear." British Thomson-Houston Co., Ltd. May 21st, 1940. (544537.)
7704. "Resistance welding electrodes." British Thomson-Houston Co., Ltd. June 18th, 1940. (544540.)
8618. "Lamp fittings." British Thomson-Houston Co., Ltd. July 9th, 1940. (544606.)
9149. "Oil-blast electric circuit-breakers." British Thomson-Houston Co., Ltd. July 19th, 1940. (544607.)
9527. "Electric lighting units for industrial, street, or general lighting purposes." Revo Electric Co., Ltd., and F. H. Reeves. July 26th, 1941. (Addition to 512908.) (544572.)
11120. "Electrolytic cells." Shawinigan Chemicals, Ltd. September 10th, 1940. (544608.)

Amended Specifications

514202. "Electric switches for alternating current circuits." G. H. Scholes & Co., Ltd., and others.
522007. "Overhead electrical equipment for trackless cars, etc." H. Ellor.
529320. "Television broadcast system." Hazeltine Corporation.
536450. "Electron discharge valve arrangements." Marconi's Wireless Telegraph Co., Ltd.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia. — QUEENSLAND. — August 20th. Townsville Town Council. 3,000-kW turbo-alternator (Specification 119). A. Robertson, town clerk, Townville.
VICTORIA.—June 3rd. State Electricity Commission. Compound-filled 11,000-V switchgear and accessories. Specifications 41-42/64.

Birkenhead.—May 18th. Electricity Department. Cables, meters and general stores. (May 1st.)

Formby.—May 25th. Urban District Council. One 2,500-kVA transformer and one 500-kVA transformer. Specifications from the chief electrical engineer, Electricity Department.

Hastings.—May 16th. Electricity Department. Boiler fuel. (May 1st.)

Plymouth.—May 30th. City Electricity Department. Condenser tubes, screwed glands and washers. (See this issue.)

South Africa.—SALISBURY.—July 2nd. City Council. Electrical metering equipment. (Contract E.19.)
DURBAN.—June 19th. City Council. Electric link switches and fuse fittings (Contract E.2052). July 17th. Telephone switchboard component parts (Contract P.263).

Orders Placed

Australia.—VICTORIA.—State Electricity Commission. Accepted. Paper and varnished cambric insulated cable (Specification 41–42/18): (a) £3,986.—Siemens (Aust.) Pty., Ltd.; (b) £4,600.—Johnson and Phillips, Ltd.; (c) £4,136.—W. T. Henley's Telegraph Works Co.; (d) £2,192.—Callenders Cable and Const. Co.; (e) £3,536.—Enfield Cables (A'sia) Pty., Ltd.; (f) £3,924.—Lawrence and Hanson Elect. Pty., Ltd.; (g) £5,210.—British Insulated Cables, Ltd.; (h) £808.—British General Electric Co. Pty., Ltd.
COMMONWEALTH. — Department of the Interior. Accepted. Motors and starters for mail handling plant, Sydney G.P.O. (£1,412).—British General Electric Co., Pty., Ltd.

Birkenhead. — Electricity Committee. Accepted. Transformers.—Bryce, Ltd.

Birmingham.—Salvage Committee. Accepted. Electric vehicle batteries for one year from April 1st.—Young Accumulator Co.; Tudor Accumulator Co.

Blackburn.—Watch Committee. Accepted. Installation of wireless equipment in police buildings and vehicles (£1,484).—G.E.C.

Huddersfield.—Electricity Committee. Accepted. Cables, poles and erection of overhead lines.—Pirelli-General Cable Works.

Liverpool.—Electric Power and Lighting Committee. Recommended. Twelve ring-main switches (£1,458).—Long & Crawford. Twelve months' supply of switchgear for static substations:—High-voltage gear.—Ferguson, Pailin. Low-voltage transformer panels.—Crompton Parkinson. Low-voltage distributor panels.—J. G. Statter & Co.

London.—SOUTHWARK.—Electricity Committee. Recommended. Stoker part replacements (£787 and £454).—Babcock & Wilcox.
ST. PANCRAS.—Borough Council. Accepted. Ventilating equipment for substation (£92).—Sturtevant Engineering Co.

Manchester. — Electricity Committee. Accepted. Static transformers. Contract extended for twelve months.—Ferranti. Low-pressure pipework.—Brightside Foundry & Engineering Co., Ltd. Static condenser.—British Insulated Cables. Traction battery.—D.P. Battery Co. Supplying and laying 33-kV feeder cable, etc.—Callender's.
Water Committee. Accepted. Electric motors and circulating water pumps.—Mather & Platt. Motor starting equipment.—Brookhirst Switchgear.

Salford.—Light, Heat and Power Committee. Accepted. Reactors for power station (£525).—Metropolitan-Vickers Electrical Co.

Southport.—Health Committee. Accepted. Electrical installation at Crossens nursery (£67).—F. W. Smith & Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Abertillery.—Extension of welfare centre to provide cooking and bathing facilities; A. G. Jones, engineer, Council Offices.

Ashton-in-Makerfield.—Erection of building for day nursery; Kearsley & Gee, Ltd., building contractors, Heath Road.

Blackburn. — Out-patients' department, to Queen's Park Hospital; W. Pickstone, borough surveyor, Town Hall.

Blackpool.—Additions to Victoria Hospital; secretary.

Boston.—Salvage depot, R.D.C.; C. Dawson, Council Offices, Market Place.

Bron-y-Nant. — Extensions to Isolation Hospital; N. S. Jeffrey, borough surveyor, Municipal Buildings, Colwyn Bay.

Durham.—Wartime nurseries:—Billingham (S. Coates, Ltd., Middlesbrough); Birtley (H. F. Mole, Chester-le-Street); Bishop Auckland (T. Manners & Son, Bishop Auckland); Crook (G. W. Lazenby & Co., Ferryhill); Framwellgate (Gradon & Son, Durham); Haverton Hill (S. Coates, Ltd., Middlesbrough); Shildon (Metcalfe & Son, Shildon); Stanley (Bell & Ridley, Durham); Washington (W. Norman, Chester-le-Street).

Gas cleansing centres: Boldon (W. D. Allison, Whitburn); Whickham (Bewley & Scott, Dunston); Houghton-le-Spring (G. M. Pearson & Son, Hetton).

Additions to first-aid post at Billingham (£763); C. H. Webster, builder, Middlesbrough.

Conversion of premises in Silver Street into British Restaurant for the City Council; F. W. Goodyear & Son, builders, Claypath, Durham.

Easington (Co. Durham).—Restoring Empire Cinema after fire (£7,000); Wm. Wheatley, manager, Seaside Lane.

Glasgow.—Additions, 1009, Gallowgate; Croft Bodybuilding & Engineering Co., Ltd.

Canteen additions, Wellington Works, Port Dundas; Ed. Macbean & Co., Ltd.

Additions, Sentinel Works; Alley & MacLellan Ltd.

Additions, shipbuilding yard; Yarrow & Co., Ltd.

Hereford.—Canteen extensions, Widemarsh Street; Barronia Metals, Ltd.

Huntingdon.—Houses, Brampton, Barham, Sawtry, Upton and Upwood; surveyor, Rural Council Offices.

Luton.—New sites and buildings for nursery centres; F. Oliver, borough engineer, Town Hall

Medomsley Colliery (Co. Durham).—Miners' canteen, Medomsley Colliery; H. Ayton & Sons, 5, George Street, Blackhill, Co. Durham.

Newcastle-on-Tyne.—Depot and store yard, Cundercum Road; city engineer.

Salford.—Reconstruction of portion of Town Hall; W. A. Walker, borough engineer, Bexley Square, Salford, Manchester, 3.

Sedgefield.—British Restaurant at Trimdon; R.D.C. surveyor.

Shrewsbury.—Erection of nursery annexe at Monkmoor School; borough engineer, Guildhall, Dogpole.

Shildon.—British Restaurant, Church Street; A. Metcalfe & Sons, Dent Street, Shildon, Co. Durham.

South Shields.—Canteen, for the Middle Dock & Engineering Co., Ltd.

Garage and timber shed for Brigham & Cowan, Ltd.; H. Hill, architect, Winchester Street, South Shields.

Sunderland.—Additions for the Missions to Seamen; J. Potts & Son, architects, John Street, Sunderland.

Clothing factory; J. Stanley Wright, Whyman Ltd., Stamp Lane.

Alterations, St. Mark's Terrace, for Hindell's Dairy Farmers, Ltd.; W. & T. R. Milburn, architects, 17, Fawcett Street.

Garage; C. Emmerson, surveyor, R.D.C. offices, The Esplanade, Sunderland.

Alterations and additions to dairy premises in Addison Street for R. Johnson; Matkin & Hawkins, Barclays Bank Chambers.

Tynemouth.—Maternity ward at the Preston Hospital to be extended (£1,137); D. H. O'Herlihy, borough engineer.

Wallsend. — Wartime nurseries; borough engineer.

South Wales Power Bill

NOTICE has been given by the South Wales Electric Power Co. of its intention to introduce a Parliamentary Bill in the present session for the purpose of authorising and ratifying the borrowing of money required for payment for works constructed or to be constructed by the company under an arrangement with the Central Electricity Board; to make provision for the redemption and cancellation of the company's existing irredeemable debenture stock; to amend or clarify sections of two previous Acts; and for other purposes connected with the company's business. Copies of the Bill may be inspected or purchased for 1s. at the company's office, St. Mellons, Cardiff, or at the offices of the company's solicitors or Parliamentary agents.

I.E.S. Awards to Students

THE Silver Jubilee Commemoration (1934) Award (five guineas and certificate) is offered annually by the Illuminating Engineering Society to a member, associate or affiliated student under the age of twenty-six. This year a second similar award is being made available under the same conditions except that candidates outside the ranks of the Society are eligible. Qualifications are the presentation of a paper on the theory or practice of illuminating engineering to any approved technical society or association, the design or construction of a novel instrument or appliance in connection with illuminations, or the carrying out of an investigation beneficial to illuminating engineering. Applications should be made to the hon. secretary of the Society, 32, Victoria Street, S.W.1, not later than June 1st.